

FLEXIBLE FUND

FINAL REPORT (INCLUDING ACTIVITIES IN THE EXTENSION PERIOD JANUARY-MARCH 2008:

1. PROJECT INFORMATION

1.1 Project Title: Developing methodologies for assessing diffuse deer impacts in the wider countryside.

1.2 Commission Number: MLU/954/06

1.3 Project Manager (Co-ordinator for large projects): Justin Irvine

1.4 Project start and end dates: 1 June 2006 – 31 March 2008

1.5 Reporting period: 1 August 2007 to 14 December 2007

1.6 Project contractors (Institution and contact names):

Macaulay Institute (Justin Irvine)

University of Aberdeen (René van der Wal formerly at CEH)

Forest Research (Helen Armstrong)

2. EXECUTIVE SUMMARY

The general aim was to develop an approach that could facilitate a consensus on what are reasonable and legislative compliant objectives, indicators and targets in relation to deer impacts outwith designated sites. There are two main outputs. (a) a legislation and policy audit identifying synergies and conflicts between objectives, including a potential strategy for implanting these objectives in the wider countryside and (b) a prototype participatory GIS-based tool that explores the potential of this technology to articulate deer-related public objectives for use in developing policy compliant sustainable deer management. Both the policy audit and the GIS start by addressing generic issues and then apply these in a specific case study area for simplicity and clarity

- The policy audit (Supplement 1) aims to identify the policies and guidance derived from legislation that deal with natural heritage and to determine which of the associated objectives are likely to be affected (positively or negatively) by deer.
- European and UK legislation has made it an obligation to include natural heritage objectives in managing land in the non-designated wider countryside. However, the raft of natural heritage and land planning policy is complex and land managers are often unaware of its implications for their management strategies.
- Wild deer have a significant ecological role as the largest undomesticated grazers in Scotland. Although aspects of deer management are specifically regulated through Food hygiene legislation and the Deer Act (Scotland) 1996, deer do not come under any statutory framework with respect to land management and are not currently subject to planning or development controls.
- Using a fictitious case study area, we examined the implications of natural heritage policies on land managers, and the impacts of deer management on wider countryside objectives. From the point of view of the private land manager, there is a lack of clarity in the interpretation and implementation of natural heritage policies by public and private conservation organisations. This may result in reducing the effectiveness of policy and incentive schemes available for management of the non-designated countryside.
- There is a need to streamline and merge the policies and objectives which have the potential to clash with each other. The potential for conflict with private objectives may be reduced if local targets and actions are set in consultation with private interests and take into account private objectives
- A suggested solution involves a risk assessment type approach involving both agency staff and private land managers. This process would assess both private and public objectives across a landscape, identify the pressures and obstacles to achieving these objectives and develop a consensus between private and public on the appropriate management response leading to an agreed management plan
- We developed a participatory GIS (PGIS, Supplement 2) as a means to collate natural heritage objectives and incorporate these with local knowledge and private objectives. The process highlighted gaps in spatial data that could be filled using knowledge derived from local land managers and agency staff.
- The PGIS was used to identify potential “hotspot” areas where deer densities may be above that tolerated by particular habitats. Collating and displaying this

information using PGIS led to greater dialogue between land managers and local agency staff and greater understanding of each others objectives and actions.

- To meet policy objectives, it is essential to engage land managers at the earliest stage so that workable assessment methods, effective monitoring and interpretation of the impacts on the natural heritage can be developed.
- The policy audit was reviewed by representatives of relevant public agencies and by the DCS. Development of the GIS has included feedback and suggestions from a) a workshop including key stakeholders from public agencies b) the DCS research strategy committee and c) a workshop attended by deer managers and local agency staff in the case study area.

INTRODUCTION AND BACKGROUND

This project aims to identify the policies and guidance derived from legislation that deal with natural heritage and to determine which of the associated objectives are likely to be affected (positively or negatively) by deer. In recent years there have been a number of European directives that have been translated into national law. The Habitats Directive and the Birds Directive have been implemented through the Natura 2000 legislation and The Water Framework Directive has also recently been applied. In addition there are objectives relating to landscape character. Forthcoming legislation such as the Scottish Soil Strategy and Floods Directive will need to be considered.

The focus of the Natura legislation and the Nature Conservation (Scotland) Act 2004 is the network of designated sites (e.g. SPAs, SACs, and SSSIs). In addition there is a duty to protect and enhance the biodiversity outwith designated areas to a) protect the integrity of the designated areas and b) to manage these areas to enhance their natural heritage value particularly in the role they might have in improving the ecological coherence of the Natura 2000 site network.

The main objective of the Natura legislation and the Water Framework Directive is that habitats, species and water bodies should be in favourable conservation status. This is achieved if the ecological requirements of those habitat and species are met, this can only be defined case-by-case and on the basis of scientific ecological assessments. While the guidelines identify what is meant by favourable status to satisfy objectives of a particular regulation, the extent that this affects the achievement of the objectives in other regulations and the interaction with key drivers (environmental change, grazing animals, tourism etc) is often not so well understood. For example, the effect of varying the density of grazing animals such as deer on the conservation or ecological status of habitats or a water body within the range of a deer population is not well described. Therefore it is difficult to agree management of deer populations that will achieve public objectives for natural heritage at the landscape scale and the private objectives at the individual land-holding level.

Objective. The overarching aim of this project is to explore the potential ways to clearly articulate the natural heritage objectives and demonstrate where deer are likely to have an impact on these objectives. Of equal importance is to highlight areas where there is a lack of information on how deer may impact these objectives and where there is potential conflict between objectives from different aspects of legislation. Clarifying the objectives of the public agencies is essential in the process of

facilitating their implementation and to involve practitioners in building consensus on what are reasonable and legislative compliant objectives, indicators and targets in relation to deer impacts outwith designated sites. Whilst economic and social impacts also need to be considered, and represented significant themes of discussion during the PGIS final workshop, they are not dealt with here, although the methods and tools developed would allow these objectives to be integrated in a subsequent iteration of the project.

Approach. The approach we have taken continues along the same lines as described in the Interim progress report of (July and Dec 2007). The two main outputs include: -

1) A legislation and policy audit identifying synergies and conflicts between objectives, and gaps in knowledge about methods for assessing and monitoring these. The audit will address the following questions as far as is possible: a) What is negotiable and what is not (determined by legislation); b) Whose objectives and views are we referring to? c) How appropriate is the evidence or expert knowledge used to form these objectives and their subsequent actions?

2) Second, a prototype GIS based tool is developed that explores the potential of this technology to articulate deer-related public objectives for use in developing policy compliant sustainable deer management.

4. PROJECT PROGRESS

Previous progress reports describe the evolution of the two main outputs above.

4.1 Land Use Policies Audit. (Full report in Supplement 1)

In the final reporting period we have solicited comments on the audit from a) representatives of agency staff who attended the Perth workshop (June 2007) and b) from members of the DCS. These have been incorporated and the final report of the desk study audits all of the land-use related policies and analyses the implications of these policies for deer management. This follows the following structure:

- A comprehensive description of the various natural heritage, landscape and deer-related legislation and how they interlink and are integrated into policy documents. This includes reference to new and forthcoming legislation.
- An illustration of the implications of these policies for land managers using a hypothetical case study based on North West Scotland to demonstrate the range of policies, local and national, that have implications and affect local deer management. Where available, examples have been extracted of the relevant indicators or information and methods used to measure these indicators.
- A suggested approach to articulating and prioritising public and private objectives, taking a site specific approach.
- A discussion of the implications for a landscape scale strategy.

Within this structure, the audit addresses the following questions:

- a) What statements, prescriptions and objectives are relevant to deer management?
- b) To what extent do the different public policies result in conflicting policy objectives?
- c) Are deer and grazing likely to affect these objectives?
- c) Are the currently available indicators used to measure grazing (deer) related impacts available and suitable for use by land managers?
- d) Do the methods needed to measure these indicators exist and are they appropriate?

4.2 A Participatory Geographic Information System (PGIS) to address Diffuse Deer Impacts (Full report in Supplement 2)

We tested a new method aimed at developing understanding and consensus between land managers and the public agencies. This is based on Participatory Geographical Information Systems (PGIS) which can aid communication between stakeholders over a resource that is disputed (Sandstrom et al., 2003) and generate more robust relationships between stakeholders (Kyem, 2002). In general, PGIS is a capacity-building and empowering tool as improving transparency and visibility between people and the state is central to its approach (McCall & Minary, 2005). It is used to legitimise local knowledge thus supporting local peoples' participation in decision making and mapping actions (McCall & Minary, 2005). One of the key elements is respect for and involvement of local knowledge early in a planning process. In this project, PGIS is developed as a platform on which stakeholders' knowledge about objectives, barriers and management needs for land and deer management are integrated, assessed and addressed in a proactive way. We have developed a PGIS approach which aims to include knowledge from local land managers about the distribution of priority habitats in the selected areas. We also use the system to provide a readily accessible means for identifying the public objectives across a landscape rather than on an individual patch of habitat. This approach allows spatial data, which is often only available to agencies and formal institutions, to become available to local groups (McCall & Minary, 2005). The PGIS then allows to knowledge about deer range and habitat use to be combined with information on the distribution of "priority habitats" (and their favourable status), and the availability of management options that can contribute to achieve such status. Development of the PGIS has involved stakeholders at different levels in its production. First the spatial data relevant to natural heritage objectives was collated into a GIS from existing sources within agencies and research institutes. Second, the GIS was developed to allow visualisation of areas where habitat preferred by deer could be assessed against its tolerance to grazing. This was subjected to a panel of agency and NGO stakeholders at a workshop in June 2007 and to the DCS Research Strategy Committee in October 2007. Further development based on these consultations were then finally presented at a workshop attended by local deer managers and agency staff using part of West Sutherland as a test area. The evolution of the PGIS through national agency involvement has been documented in the previous progress reports. Here we report on the response of local stakeholders to a PGIS designed to facilitate discussion and consensus on diffuse deer impacts in the wider countryside.

This workshop aimed to capture the response of deer managers and local agency staff to a PGIS approach and use this as a basis for reporting on the extent to which this approach could be useful in developing a shared consensus on the management's needs for deer and natural heritage in the wider countryside. Specifically we are interested in evaluating whether this process is:

- a) Useful in clarifying the public objectives, and can highlight areas where land-use policies are in conflict with each other; and
- b) Useful in identifying and reaching consensus on which areas should be the focus of increased monitoring and special management (and resources needed to achieve management objectives), as well as agreeing that in other areas, less intense or no additional monitoring is required.

The premise of this work is that incorporating the opinions and knowledge of local land managers and stakeholders and allowing them to influence how policy is implemented on the ground will lead to more successful delivery of public and private objectives for the wider countryside.

Supplement 2 also contains appendices that illustrate how the GIS works (in powerpoint)

The Final report is due on 31st March 2008.

In agreement with SEERAD nominated Officer, the end date of the project has been extended to 31st March 2008 in order to allow time to test stakeholder response to the GIS approach in a case study setting. Due to difficulties in timetabling, the workshop did not take place until 27th March thus the report is delayed until end April 2008

5. COMMUNICATED OUTPUTS

- 5.1 Natural heritage and deer related legislation and policy Audit (Supplement 1, page)
- 5.2 Response of local practitioners and agency staff to the PGIS (Supplement 2)
- 5.3 Three interim progress reports.

6. RESOURCES

- 6.1 Interim cost statement

	To 31.03.08
Macaulay Staff (inc 48% O/H)	45690.23
CEH Staff (inc 78% O/H)	1080.46
Forest Research Staff (inc 78% O/H)	8125.04
University of Aberdeen (inc 78% overhead)	10465.00
T&S	662.23
Overall Total	66022.96

7. PROJECT MANAGEMENT

- 7.1 Project Management is provided by Justin Irvine, at the Macaulay Institute and Mike Daniels, Deer Commission for Scotland who have communicated regularly via e-mail and telephone (Latterly Nick Halfhide). The GIS was discussed with the DCS Research Committee and further development of this approach was agreed and this additional work necessitated an extension on the project end date to end March 2008. The extra work involved a workshop in the case study area which was held at the earliest opportunity and occurred in late March. Project personnel met regularly (on average twice per month) to discuss the development of the policy audit and GIS.

8. REFERENCES

See Supplements 1 and 2.

Supplement 1

Developing methodologies for assessing diffuse deer impacts in the wider countryside.

Policy Audit

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March 2008

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Summary

Whilst rural areas cover almost 95% of Scotland's land surface, less than 15% of this area is protected under natural heritage legislation. European Commission and UK legislation makes it an obligation to include natural heritage objectives for land managed in the non-designated wider countryside.

This Report examines the various relevant legislation and policies in order to determine the objectives and assessment methods that are available to develop suitable land management strategies.

The Report goes on to identify those areas where more clarity is needed, and where there is either conflict or the potential for conflict between management objectives. Implementation of the current land use policies, the potential problems, and conflicts are illustrated through the use of a fictitious Case Study area, and the impacts of deer management on wider countryside objectives are examined. This Case Study section can be read as a 'stand-alone' piece within the Report.

A suggested solution for balancing public and private objectives is then considered, in order to manage diffuse deer impacts in the wider countryside and to agree the landscape management most appropriate for an area.

Finally, there is a discussion of the potential opportunities for articulating public objectives for managing land in private ownership, and for establishing successful management of the wider countryside in the light of future challenges and pressures on the natural heritage.

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1. Background

Rural areas cover almost 95% of Scotland's land surface and the principal land uses are agriculture, forestry, tourism, field sports (predominantly involving management for red deer and game birds), amenity interests, and, more recently, renewable energy. Whilst less than 15% is protected under various natural heritage legislation¹, there is also a statutory duty to manage land outside designated areas in accordance with this legislation. Factors that drive change across natural landscapes, such as shifts in grazing systems, climate change, renewable energy expansion, and forest restructuring, need to be managed in order to implement these landscape strategies.

Conservation of species, habitats and other natural heritage features has become increasingly important in recent decades. This has led to a complex network of legislation whose policy framework, to date, has produced a patchwork of protected sites with an array of regulations for the large variety of features and targets for their conservation and enhancement. Although the condition of the vast area of non-designated wider countryside is important for the protection of habitats and species within any adjacent designated areas, policy guidelines and their implementation for non-designated countryside have been less well developed. Recent European Commission legislation has led to an obligation for the UK government to firstly, ensure that 95% of the designated sites are in favourable condition, and second, to incorporate natural heritage objectives in management of the non-designated wider countryside. Therefore it has become increasingly recognised that improved awareness of the wider landscape character and conservation management will be an important aspect of meeting international and national biodiversity policy requirements, and that future UK policy aims need to reflect this.

In order to meet these aims, there is a need to clarify the raft of legislation and resulting policies that impact the wider countryside, as well as to develop an understanding of what the public objectives are. Analysis of how these policies fit together and where their objectives may conflict is necessary. The challenge for future conservation policy will be to plan and manage landscapes on a large enough scale, and to promote agreement with land managers to adapt land-use practices to those that enhance biodiversity value. Research to underpin policy in this area involves national survey and monitoring programmes (often in partnership with government agencies and non-governmental organisations, NGOs), and increasingly relies on indicators of habitat or wildlife 'health'. Whilst work in this area is relatively well advanced across designated sites (almost 10% of rural Scotland is designated as Special Areas of Conservation or Special Protection Areas), much still needs to be done to monitor and manage favourable conservation status in the wider countryside, and to understand how private objectives, such as deer management, impact public conservation policy. This is fundamental to developing a sustainable landscape-scale management strategy that delivers the services expected by society over the decades to come.

Objective

In the first sections of this report we attempt to clarify the public landscape objectives, how they are delivered, and how their implementation within the wider countryside is monitored. We go on, through the use of a 'stand-alone' Case Study, to highlight the extent to which policies either link together or are in conflict, and the impact that deer might have on the delivery of desired policy outcomes.

2. Legislation impacting the non-designated natural landscape in Scotland

This section presents a broad assessment of the legislation, summarising where the drive for legislation has come from, how it links together (Fig 1) and comments on any expected future legislation developments. Greater detail on the legislation can be found through the numbered information sources that are listed in Appendix 2.

2.1 Habitats and Species in non-designated areas

2.1.1 Natural Heritage policy

Biodiversity legislation and strategy

As a member state signed up to the **European Community (EC) Birds Directive (1979)**² and **Natural Habitats Directive (1992)**³, the UK is obliged to ensure that wild birds and those habitats and species endangered at European Union (EU) level (listed under Annex I, II, IV and V) must be maintained at favourable conservation status. In order to achieve this, a network of legally protected sites (across the EU called Natura 2000 sites) has been put in place in member states, together with site management agreements, ensuring that future development does not damage important habitats while taking account of relevant social and economic issues. Additionally, there is an obligation to protect those listed habitats and species found outside designated areas, within the wider countryside. Any work on adjacent land likely to affect Natura 2000 sites must be undertaken in ways that does not damage their value for the designated habitats or species, and only after consultation with the statutory conservation organisation. EU directives can have an overriding authority to influence proposals where the 'priority' habitats or species are found.

The Conservation Regulations for Natural Habitats (1994)⁴ transposes the natural Habitats Directive into law. It has since been amended several times, including the 2007 (Scotland) amendment to increase the legal requirement for land managers to assess their land for the presence of European Protected Species (EPS). Managers may need to moderate their operations to avoid disturbing or harming EPS, their breeding sites or resting places, or apply for a licence if likely to commit an offence. The Regulations provide for surveillance of the conservation status of natural habitat types and species of EC interest.

Within Scotland, the **Nature Conservation (Scotland) Act 2004**⁵ strengthens wildlife enforcement legislation within designated sites, as well as in the wider countryside. It puts a duty on every public body to further the conservation of biodiversity consistent with the proper exercise of their functions. It strengthens Nature Conservation Orders (NCO), and provides Land Management Orders for land around and associated with designated sites in order to enforce wildlife legislation, ensuring that operations carried out conserve, restore or enhance a specified habitat or species. The Act requires ministers to designate strategies for the conservation of biodiversity, and in Scotland this takes the form of the **Scottish Biodiversity Strategy**⁶. This Strategy, which covers a period of up to 2030, is implemented by the **Scottish Biodiversity Group** and their **Scottish Biodiversity Forum (SBF)**⁶ which has a remit to publish lists of species of flora and fauna and habitats of principal importance (see Box 1).

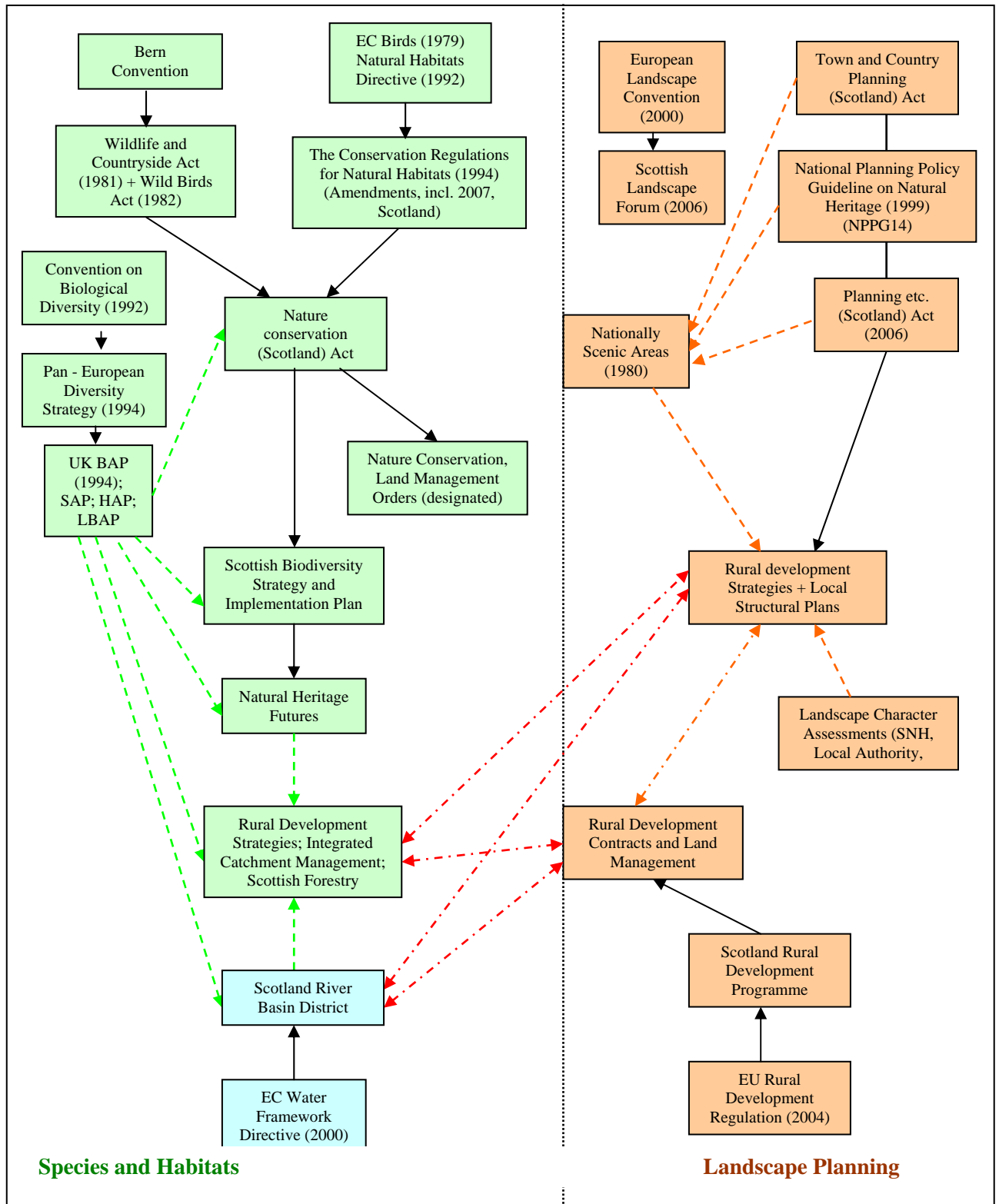


Figure 1. Current legislation that impacts ‘Species and Habitats’ and ‘Landscape Planning’ in the wider countryside. Solid arrows: connect a policy that has developed from a previous policy; Dashed arrows: connect policies that ‘feed into’ another policy, or where there is the potential for conflict. They are not necessarily formal links identified by legislation.

Box 1

The SBF aims for the **Scottish Biodiversity Strategy** are:

- To halt the loss of biodiversity and continue to reverse previous losses through targeted action for species and habitats.
- To increase awareness, understanding and enjoyment of biodiversity, and engage many more people in conservation and enhancement.
- To restore and enhance biodiversity in all urban, rural and marine environments through better planning, design and practice.
- To develop an effective management framework that ensures biodiversity is taken into account in all decision making.
- To ensure that the best new and existing knowledge on biodiversity is available to all policy makers and practitioners.

The SBF is a broad-based working partnership of public, private and voluntary organisations and has produced a **Scottish Biodiversity Implementation Plan** ⁷, which approaches regional biodiversity based on an assessment of opportunities and constraints for meeting the aims of the Strategy. It sets specific targets and actions for biodiversity conservation in urban, rural and marine environments, and its delivery is dependant on the statutory bodies and NGOs. In particular, the SBF, through its Scottish Biodiversity Implementation Plan, states that it will approach biodiversity conservation by:

- Developing guidance in relation to maximising biodiversity in all open spaces, landscape and ecosystem planning and management by responsible authorities.
- Increase integration between policies, programmes, actions and incentives across government (e.g. terrestrial, water directives, Common Agricultural Policy).
- Developing cost-effective biological indicators relating to landscape scale biodiversity, effective biodiversity management, ecosystem health, structural diversity, as well as indicators for social engagement.

Biodiversity Action Plans and descriptions

The SBF also provides Scotland's response to its obligations under the **Convention on Biological Diversity (1992)** ⁸ which has led to the creation of a **UK Biodiversity Action Plan (UKBAP)** ⁹. The plan provides a framework for prioritised and targeted action for species and habitats, and includes a classification list of 'Broad' habitats to allow consistent reporting and to set the context for 'Priority' habitats and species that are considered to require special conservation action. The resulting **Species Action Plans (SAP)** ¹⁰ and **Habitat Action Plans (HAP)** ¹⁰ provide advice and targets for achieving favourable conservation status for those listed habitats and species. The list of Priority species and habitats has recently been updated in the Species and Habitat Review Report (2007) ¹¹ and a number of priority actions for species or habitats have been 'signposted' or categorised into various broad means of implementation, such as the need for additional research or surveillance and monitoring. **Local Biodiversity Action Plans (LBAP)** ¹² are put in place to ensure effective delivery of the UKBAP on the ground, as well as raising awareness of local biodiversity, and are compiled by statutory conservation agencies and local stakeholders. The plans draw on and

incorporate relevant SAPs and HAPs, and are now established in almost every Council area.

In order to help set geographical priorities, Scottish Natural Heritage (SNH) has divided Scotland into 21 zones, called **Natural Heritage Futures (NHF, 2002)**¹³, within which all aspects of the natural heritage are described. SNH has adopted this landscape-wide approach in order to allow improved co-ordination for the protection of species, habitats and landscape character. It recognises that this is necessary to ensure effective protection for species that disperse over wide areas, to provide 'habitat corridors' and to develop effective management on non-designated as well as designated land. The NHF prospectuses are being used to help deliver the Scottish Biodiversity Strategy, and will be used to inform local development plans, local Biodiversity Action Plans, catchment management and to aid implementation of the Habitats and Birds Directives. As they operate at the large scale, the zone descriptions do not provide information for individual sites. The NHF descriptions will also be available to aid implementation of the more recent Soils and Water Framework Directives (see Section 2.2).

Agri-environment Schemes

Reform of the **Common Agricultural Policy (CAP)**¹⁴ has led to the Scottish Government carrying out a recent consultation to restructure their **Scotland Rural Development Programme**, together with development of new **Rural Development Contracts (RDC)**¹⁵ designed to encompass many previous agri-environment schemes. As a part of this, for land managed through agricultural activity, the Scottish Government developed **Land Management Contracts (LMC)**, introduced to Scotland in 2005 to help encourage sustainable land management. This is currently under further review and will be replaced by non-competitive **Land Managers' Options (LMO)**¹⁵ (equivalent to LMCs) and a more competitive level of Rural Development Contract called **Rural Priorities**¹⁶ which will be delivered jointly by the Scottish Government Rural Payments and Inspections Directorate (SGRPID), SNH and Forestry Commission Scotland. RDCs offer a whole farm system of support which makes payments for the delivery of environmental, social and economic benefits for public good. The concept has tiers of measures intended to incorporate biodiversity aims:

Tier 1 – The Single Farm Payment and cross compliance. Securing a basic level of environmental protection, food safety and animal welfare.

Tier 2 – LMO Menu Scheme

Delivering widespread benefits leading to economic, social and environmental improvement (non-competitive).

Tier 3 – Rural Priorities (Under Development and Review)

Delivering tailored benefits leading to economic, social and environmental enhancement, and taking into account LBAP targets. Targeted benefits, contributing to regional priorities, will be available to those able to deliver the best contribution, (competitive scheme).

The Scottish Executive Environment and Rural Affairs Department (SEERAD) Notes for Guidance available to land managers list many management options to choose from depending upon their circumstances, their plans for future business development, and what measures they are eligible for under the Tier 2 Menu Scheme

(Box 2). Some measures such as training and farm visits are one-offs. Others, such as the agri-environment measures and the animal health and welfare programme, run for five years. All land managers in Scotland can apply, but must be registered with the Integrated Administration and Control System and have a business reference number. As a part of the agreement, land managers must allow SEERAD or Forestry Commission staff access for site inspection. Breaking a management agreement can lead to recovery of funds, a penalty if there had been economic gain as a result of the breach of contract, or exclusion for two years from agri-environment schemes.

Forestry legislation and strategy

Box 2

Rural Development Contracts Tier 2 activities within the menu scheme include:

- **Membership of quality assurance and organic certification schemes**
Example: Scottish Quality Wild Venison Assurance Scheme
- **Creating buffer areas** to establish a network of wildlife corridors, and protect and enhance habitats (5-year scheme) – This includes no grazing, no supplementary livestock feeding and no fertiliser application within a 3m-6m wide buffer area around areas of wetland, species-rich grassland or woodland.
- **Management of moorland grazing** – the land manager reports on the current condition and management of the moorland pasture and highlight the changes they propose in shepherding, managing livestock and feeding practices in order to benefit the environment, encourage a wide range of habitats and wildlife. Grazing livestock includes farmed deer.
- **Improving public access.**
- **Farm woodland planning and management** – to help the land manager identify opportunities to apply for Scottish Forestry Grant Scheme, assess woodland condition and the work needed.

The Scottish Forestry Strategy (2000) set out policies and priorities linked with UKBAP targets. It was reviewed during 2005/6 and replaced by **The Scottish Forestry Strategy (2006)**¹⁷. Its aims include encouraging sustainable forest management, social inclusion through providing employment opportunities and recreation, and integration with other land uses and businesses. Amongst the objectives outlined to achieve this, the Strategy lists using forestry practices to help reduce the impact of climate change, support economic growth and development, and protect the environmental quality of natural resources (water, soil and air). Biodiversity objectives include extending and enhancing native woodlands by developing forest networks, aiding recovery of acidified rivers and improving riparian habitat.

Guidelines and incentives include **Regional Forestry Forums** to advise on forestry policy and practice, **Forestry Frameworks** to provide an overview of areas which might be suitable and desirable for woodland, and grants such as the **Scottish Forestry Grant Scheme (SFGS) (2003)**, Woodland Grant Scheme or Woodland Creation to provide incentives to address these priorities. In the future, such grants will be administered through Rural Development Contracts.

The Forestry Strategy is enforced by the Forestry Commission Scotland (FCS), whose aims are to:

- Protect UK forests and woodlands
- Expand UK woodlands

- Enhance the economic value of forest resources
- Conserve and improve the biodiversity, landscape and cultural heritage of forests and woodlands
- Develop opportunities for woodland recreation
- Increase public understanding and community participation in forestry.

The Commission has a duty to achieve a balance between afforestation, timber production, and the conservation and enhancement of protected natural heritage.

2.1.2 Planning policy

Planning legislation and strategy

Together the **Town and Country Planning (Scotland) Act (1997)**¹⁸, the **National Planning Policy Guideline on the Natural Heritage (NPPG14, 1999)**¹⁹, and the **Planning etc. (Scotland) Act (2006)**²⁰ endorse and strengthen the protection of **Nationally Scenic Areas (NSA, 1980)**²¹, and set out planning guidelines for rural areas. NSAs are considered of national significance for their outstanding scenic interest as part of Scotland's natural heritage and are intended to provide an additional planning control, which requires consultation with SNH. However, many NSAs do not have specific management strategies. The NPPG14 describes national planning policy considerations and main statutory obligations in relation to conservation of the natural heritage, and draws attention to the importance of safeguarding and enhancing natural heritage in non-designated areas. The Guideline recognises the interlinking quality of the natural heritage, and that environmental and socio-economic dimensions are equally important (Box 3). SNH has a statutory role in development control and providing advice through UKBAP, LBAPs and the Scottish Biodiversity Group. However, the level of protection afforded to natural heritage interests in non-designated areas is not normally as high as that afforded to sites of national or international importance.

The Planning etc. (Scotland) Act (2006) proposes a **National Planning Framework** that will set out how Ministers guide how land use is to develop. The Act affords greater power and statutory guidance for planning authorities than previous Planning Acts, which must be adhered to. Together with the NPPG14, the Act forms the policy driver behind **Rural Development Strategies** and **Local Structural Plans**, as well as non-statutory Local Landscape Designations that safeguard areas against inappropriate development. Local Plans are achieved through local engagement and landscape level policy, whilst LBAPs identify wildlife objectives.

Box 3

The aims of the **National Planning Policy Guideline on the Natural Heritage (NPPG14)** include:

- Prevent habitat fragmentation.
- Promote integrated habitat network to maintain and enhance biodiversity.
- Incorporate Landscape Character Assessments into the planning process and promote environmental development schemes.
- Development and Structural Plans should not harm species protected under the Wildlife and Countryside Act (1981), EC Directives, or priority species and habitats from the UKBAP.
- Safeguard lochs, watercourses, wetlands, within the wider framework of catchment management.

Landscape assessment

In order to provide information at a local level, SNH and Local Authorities are developing the use of **Landscape Character Assessments (LCA)**²². These describe a defined area to both capture and encourage enhancement of its existing qualities, and to reach higher standards in the planning and design of new development as well as management of land use. LCA is an analytical technique which identifies areas with a distinct composition of inter-related natural, physical, cultural and historical characteristics. A national programme of LCAs was initiated by SNH in 1994 covering 29 regional studies, together with local authorities and other organisations. The assessments are intended to be used in conjunction with the Geographical Information System (GIS) LCA data which comprises 25 LCA areas relating to the initial 29 LCAs in the review series, the difference being an amalgamation of smaller studies into adjacent and overlapping study areas.

An example of how planning authorities and natural heritage strategies might be linked can be seen in The Highland Region Structural Plan (2001), which states that ‘all land use change proposals can be assessed for their compatibility with the present landscape character of the region using the LCA and Natural Heritage Futures’ descriptions. Local Plans will include a summary of these studies in order to inform planning decisions, development of forestry, infrastructure, agriculture, electricity and telecommunications.

Rural Development Contracts (see previous section, 2.1.1).

The UK signed up to the **European Landscape Convention (2000)**²³ in 2006. Through their obligations to the Convention, SNH established the **Scottish Landscape Forum (2006)**²⁴, which advises the Scottish Government of the landscape content of new planning policy guidance for the natural heritage. The Forum will review landscape legislation, making it a requirement for public bodies to follow policy guidelines such as the NPPG14, and to create more effective planning statements within the revised National Planning Framework. This includes following the **Strategic Environmental Assessment Scotland** directive to achieve sustainable development and sustainable use of biodiversity. Additionally, the Forum aims to develop national and local ‘landscape indicators’ in order to assess policy effectiveness.

2.1.3 Current indicators of conservation status

A list of species and habitats targeted by the SBF and UKBAP can be found on the UKBAP website¹⁰. The SBF and UKBAP biodiversity goals relevant to private management of these species and habitats in the wider countryside of the Scottish uplands include:

- Halting losses and improving condition of farm woods and semi-natural habitats such as heathland.
- Strengthening the role of natural processes in forests and woodlands, focussing on species conservation, restoration, expansion and habitat network development at a landscape scale.
- Enhance ecological resilience at a landscape scale in order to maintain or enhance mosaics of habitats that will be able to adapt to climate and socio-economic change.
- Integration of biodiversity into development of agri-environment schemes, enhancing management of deer populations to reduce impacts on biodiversity, and develop market-pull mechanisms to encourage sustainable management.

Actions that need to be taken to achieve these goals include information gathering and populating databases, undertaking a baseline survey, developing good practice and advice, securing 'favourable site management', and the continued development of agri-environment schemes. Grazing is a key factor in maintaining or degrading many open habitats and woodland, but wild herbivores, such as deer, affect the land across management boundaries. Many upland habitats are facing loss of cover or decline, and 'inappropriate grazing levels' (for example, too low or high grazing density) have been identified as the most common issue (SBF Strategy Implementation Plans 2005-2007⁷). Other important drivers of habitat change include nutrient enrichment, largely from nitrogen deposition, and climate change.

Current indicators and guidance

Appropriate indicators are needed to monitor current status and change within the target habitats and species. To date work has primarily been focused on a species or habitat within a target area, typically within designated sites. For 'Broad' and their sub-divided 'Priority' habitats, HAPs provide objectives and targets, and list measurable indicators of habitat condition and monitoring methods based on published literature, such as the 'Common Standards Monitoring Guidance for Upland Habitats' (Joint Nature Conservation Committee, JNCC)²⁵. An example of the HAP for the Priority habitats 'calcareous grassland', where grazing can be important for maintaining the number of species and preventing scrub encroachment, and 'native pine woodland' can be seen in Boxes 4 and 5. However, this approach creates actions for species or habitats in isolation, without referring to their relationship with local land use or habitat mosaic in which they occur. This is likely to reduce the effectiveness of the Action Plans. Agencies such as SNH are beginning to address these issues by assessing biodiversity targets from Action Plans, the likelihood of their achievement and how to resolve any potential conflicts. Additionally, for a number of species and habitats such as some lower plants or sub-alpine heath, their SAPs and HAPs are still under development due to gaps in research and knowledge.

Literature produced by statutory bodies such as Natural England (NE), SNH, FCS and the Deer Commission for Scotland (DCS) contain guidance, often in the form of

tables and flow charts, to help staff assess impacts on habitats from pressures such as grazing, the resulting level of ‘damage’ and so the ‘condition’ of a site. However, many definitions of ‘favourable condition’ and ‘damage’ for habitats in both designated and non-designated areas require more development, and depend on an assessment of the local importance of particular natural heritage features and the objectives for a site. For example, the impacts of grazing can be measured, but describing ‘damage’ is a judgement that the impacts are deleterious for that particular location. It is also difficult to tease apart the impacts of deer and sheep grazing. The suitability of the indicators currently used to measure deer impacts are discussed in Section 3.1.4.

Future delivery

The SBF Implementation Plan acknowledges that financial resources are modest, but significant in terms of staff time to develop and deliver biodiversity programmes. However, land managers will still be required to do much themselves on the ground. This may include assessment of what habitats and species they have, what condition they are in, and whether management plans are working to achieve their objectives, for example as a part of their RDCs. There is therefore a need for more ‘cross-boundary’ or wider landscape survey methods of habitat condition, with simple indicators easily monitored by land managers as well as agency staff, particularly as many habitat types and networks cross management boundaries. Developing an ‘ecosystem approach’ using broad-scale indicators is discussed in more detail in Section 3.1.4 ‘Land manager involvement in assessments’.

In many areas of Scottish natural heritage policy, more research is therefore needed before the recommended actions can be fully developed, practicalities considered, indicators developed and management advice delivered. For example, engaging business with local biodiversity aims; developing an ecosystem approach to the management of land and water resources, or incorporating climate change research into biodiversity management. Working Groups are being set up to address this need for further research, but this is a long way from delivering advice ‘on the ground’. The many overlaps with Freshwater and Soils policies also need to be considered when planning biodiversity at a landscape level. A key factor in delivering the SBF aims will be fostering a close relationship amongst the diverse stakeholders and management schemes.

Box 4

Priority Habitat: Upland Calcareous Grassland

Habitat objectives and targets (as set out in the UKBAP and HAP*):

- Maintain the current distribution and extent of upland calcareous grassland.
- Achieve favourable condition for at least 75% of upland calcareous grassland through sympathetic management by 2005 or as soon as biologically practical thereafter.
- Initiate pilot attempts to re-create at least 200 ha of upland calcareous grassland by 2005, with a particular emphasis on reducing fragmentation through linking small, vulnerable and discontinuous sites

Very light or absent grazing with subsequent scrub encroachment, although more a problem of lowland calcareous grasslands, can be a localised problem in the uplands and may be deleterious if it leads to a decline in species-richness. Heavy grazing can cause soil erosion and may adversely affect species-richness and structural diversity, with a loss of tall herbs in particular.

Example of indicators and monitoring methods for grazer impacts**:

Measurable Condition Indicators	Condition Monitoring Methods
At least 25% of tips of live leaves and/or flowering shoots should be >5cm above ground and 25% <5cm above ground.	Assessed against a visual estimate at 1m ² scale.
At least half of statements (a) to (f) should be true a) Less than 10% of grass and sedge tillers uprooted. b) Less than 10% of live leaves with signs of having been grazed for any of <i>Alchemilla alpina</i> , <i>Nardus stricta</i> , <i>Prunella vulgaris</i> , <i>Sibbaldia procumbens</i> , <i>Thymus polytrichus</i> . c) Less than 50% of live leaves of legumes or <i>Plantago lanceolata</i> with signs of having been grazed. d) Less than 66% of live leaves of grasses with signs of having been grazed. e) Less than 25% broken or uprooted (any of) <i>Huperzia selago</i> , <i>Minuartia sedoides</i> , <i>Saxifraga hypnoides</i> , <i>Selaginella selaginoides</i> , <i>Silene acaulis</i> . f) More than 50% of the shoots of <i>Dryas</i> at least 3 cm long.	Assessed against a visual estimate at 1m ² scale. Not all statements a-f will be applicable at all sites.
At least 50% of <i>Dryas</i> leaves should be about 1.5cm long. Leaf length immaterial if there is more than 2 flowers per 100	Assessed against a visual estimate at 1m ² scale.
The percentage ground cover for which dead plant litter forms a 'thatch' in patches more than 2cm across should be <10%.	Assessed against a visual estimate at 1m ² scale.
<10% of ground cover should be disturbed bare ground.	.Assessed against a visual estimate at 4m ² scale.

* <http://www.ukbap-reporting.org.uk> and <http://www.ukbap.org.uk/habitats>

** From CSM Guidance for Upland Habitats (Excluding CG14) (October 2006) Joint Nature Conservation Committee, Peterborough <http://www.jncc.gov.uk/page-2237>

Box 5

Priority Habitat: Native Pine Woodland (definition in FCS Guidance Note 20)

Habitat objectives and targets (as set out in the UKBAP and HAP*):

- Maintain the current extent and distribution of native pine woodland, including both semi-natural and planted woodlands, and the current extent and distribution of ancient semi-natural pinewoods. Update baseline with Scottish Native Woodlands Survey (SNWS).
- Improve the condition of the current area in the 'core areas' of the pinewoods listed in the Caledonian Pinewoods Inventory (CPI). Achieve favourable condition of 15500 ha of native pine woodland in CPI 'core areas' by 2015. (Condition assessment to follow Site Condition Monitoring approach).
- Achieve favourable condition of 56600 ha of native pine woodland outside CPI 'core areas' by 2010.
- By 2005, expand areas of the pinewoods by establishing 5600 hectares predominantly by natural regeneration - mainly in the 'regeneration zones'. By 2005, create the conditions for a further 5600 ha to be naturally regenerated over the next 20 years. By 2005, establish 25000 ha of new native pinewoods on suitable sites within the natural range of native pinewoods.
- By 2015, expand the area of native pine woodland by 25,800 ha outside CPI core areas, and by 12,500 ha within CPI core areas.

Indicators and monitoring methods for grazer impacts**:

Measurable condition indicators	Condition monitoring methods (ideally carried out in Feb/March)
Tree regeneration - abundance of seedlings/ saplings and browsing pressure	Abundant unbrowsed seedlings and saplings indicate limited herbivore impacts
Tree regeneration – abundance of seedlings/ saplings and browsing pressure	No saplings above ground layer of vegetation. No tree regeneration except in areas inaccessible to grazers – moderate/heavy impacts
Preferentially browsed species - signs of browsing on palatable species (bramble, honeysuckle, greater wood-rush)	Heavily browsed or species confined to areas inaccessible to grazers - moderate impacts. Occasional signs of browsing - low impacts
Height of browse-line	Window of depleted vegetation from ground level to 1.5-1.8m - moderate to heavy herbivore impacts. Branches in understorey well within reach of browsers - low impacts
Epicormic shoots	Obvious difference above and below browse-line indicates moderate/heavy impacts
Basal shoots	>75% grazed - moderate/heavy impacts
Ground flora	sward <5cm and dominated by grasses - moderate/heavy impacts (NB - unpalatable grasses <15cm)
Bark stripping/ fraying	>10% trees affected - moderate/heavy impacts
Ground disturbance	sheep tracks/ poaching over >20% plot - moderate/heavy impacts
Additional signs of adverse impacts by herbivores	Age class of woodland skewed / becoming skewed towards older age classes, with no signs of regeneration for > 20 years. Low growing trees and shrubs pruned to a topiary effect. Shrub layer absent or along fence-lines. Bulky common mosses present at the expense of rarer species.

* <http://www.ukbap-reporting.org.uk> and <http://www.ukbap.org.uk/habitats>

** From (1) Thompson, R. Peace, A. Poulson, L. (2005) [A judgement – based method to identify overgrazing in English upland native woodlands](#). English Nature Research Reports, No. 621, and Forest Research; (2) Damage by wild deer to woodland and the natural heritage. DCS/SNH/FCS Guidance Note.

2.2 Water and Soils in the wider countryside

2.2.1 Water policy

Water legislation and strategy

The **EC Water Framework Directive (2000) (WFD)** ²⁶ establishes a new and legal framework for the protection, improvement and sustainable use of surface waters, transitional waters, coastal waters and groundwater across Europe. Its aims are to prevent deterioration and enhance status of aquatic ecosystems, including groundwater; promote sustainable water use; reduce pollution; and contribute to the mitigation of floods and droughts (Box 6).

The Directive became law in Scotland through the **Water Environment and Water Services Act (2003)** ²⁷ and is being taken forward by the Scottish Environment Protection Agency (SEPA). One of the work areas being developed is River Basin Management Planning, requiring each river basin district to have a **River Basin Management Plan (RBMP)**, produced in consultation with stakeholders. River basin planning will have an ongoing role in contributing to the development and delivery of the following important WFD outputs:

- Assessment of the pressures and impacts upon the water environment;
- Design of monitoring programmes to assess impacts and monitor changes;
- Setting of environmental objectives;
- Identification and delivery of measures to improve the environment.

There are two River Basin districts in Scotland being developed by SEPA, the largest being the Scotland River Basin District, and the RBMPs for these are planned to be finalised by 2009. The aims of the plans are to improve and support sound and sustainable water management, as well as being flexible in their approach to setting appropriate plans and objectives, in an attempt to balance environmental, social and economic needs within the river basin districts.

Scotland River Basin District

The **Scotland River Basin District** ²⁸ has been split into eight sub-basin districts, aligned where possible with local authority boundaries. Each sub-basin district has an Area Advisory Group to involve the key stakeholders in decision-making, which will produce an Area Management Plan. The River Basin Planning Strategy (2005) for the Scotland River Basin aims to aid participation and consultation, to co-ordinate the management of water and land effectively, and to integrate the RBMP within other planning initiatives. Specific recommendations are made on the important relationship between the RBMP and statutory Development Plans, and a Planning Working Group will aim to inform and assist coordination between these plans during the preparation of the RBMP in 2009. This group will include representatives from SEPA's river basin planning team, the Scottish Government, planning authorities and local authority development planning functions. It has been identified that a number (691) of Development Plans may be relevant to the WFD, thus future development pressures need to be borne in mind when programmes of measures are established.

Indicators of ecological status

Scotland's WFD aquatic monitoring strategy requires water bodies to be defined and their quality status, or **ecological status** ²⁹, reported. Monitoring will include an

assessment of whether a water body is ‘at risk’ of failing to meet environmental objectives based on pressure information, and an assessment of any changes in the status of the water body resulting from the agreed programmes of measures. For water bodies under pressure, the most sensitive element, or ‘ecological reference indicator’ to that pressure must be monitored by SEPA. For example, macroinvertebrates will be monitored in situations where the release of organic sediment or nutrients into the water body is regarded as a pressure through diffuse sources of pollution.

Links with other policies

SEPA will also work with the SBF to develop procedures for biodiversity priorities to contribute to RBMP production, and with LBAP initiatives to identify how they can contribute to and benefit from river basin planning. Additionally, farm management may impact the water environment through diffuse sources of pollution such as agriculture (run-off), and forestry activity (mainly afforestation, see Scottish Forestry Strategy), which may also cause morphological alterations. These pressures and their impacts may prevent the water body from achieving good ecological status. Changes in the structure of farmland, or in the extent and condition of moorland, are also relevant to wildlife and the water environment. The agricultural sector will therefore play an important part in achievement of RBMP objectives, for example addressing diffuse pollution, and the role of farmland in managing flooding. This is expected to be achieved through a mixture of voluntary measures, regulatory tools, and funding mechanisms such as Scottish Rural Development Plan, Single Farm Payment Scheme, best management practices, and particularly through Rural Development Contracts and LMOs. Catchment Management Plans that approach managing water resources at a local level can also contribute to RBMPs. These are typically issue-led, for example as part of a Special Area of Conservation designation.

Where water bodies supply drinking water to more than 50 persons, they must be identified and protected under the WFD, and classified as **Drinking Water Protected Areas**³⁰. Other pre-existing designated areas are also given particular protection under the WFD to comply with the standards and objectives of the protected area. They include Nutrient Sensitive Areas under the Nitrates Directive (91/676/EEC)³¹ and the aquatic part of Natura 2000 sites.

Box 6

The objectives of the **Water Framework Directive** are to:

- Prevent deterioration and enhance the status of aquatic ecosystems, including those dependant on groundwater;
- Promote sustainable water use;
- Reduce pollution;
- Help reduce the effects of floods and droughts.

2.2.2 Soils policy

Currently in the UK, consideration of management impacts on soil is included in the Impact and Environmental Assessments required at the proposal stage for developments of plans and programmes. Within the agricultural sector, preventing soil erosion and maintenance of soil organic matter and soil structure are addressed

within the CAP framework in Scotland for Good Agricultural and Environmental Conditions. UK management incentives to protect soils from degradation by agricultural practices are provided through schemes such as Rural Stewardship or the Farm Business Development Scheme, planned to be combined under Rural Development Contracts (see Section 2.1.1 Natural Heritage Policy for more detail).

The proposal for a **Soil Framework Directive**³² was published in September 2006 and is being considered by the European Parliament. The Directive would introduce requirements on Member States aimed at improving levels of soil protection and enhancement. This would include establishing a framework to protect soil where land users will be required to take precautionary measures if their use of the soil is expected to significantly hamper soil functions; identifying areas at risk and seeking to reduce the risk, and establishing a national soil remediation strategy.

Together with key stakeholders, the Scottish Government is currently developing a **Scottish Soil Strategy**³³ to provide a framework for soil protection, where soil is seen as an asset for the future of the Scottish economy as well as a contribution to the challenges set by climate change. It will include a soil monitoring system to help provide trends in soils quality and will be used to target policies better. Unlike air and water, where there have long been monitoring networks in place, there is little information on the state of soil quality within Scotland.

Soil degradation affects other environmental areas for the protection of which UK and sometimes EU legislation exists, such as the Habitats Directive and Water Framework Directive. The current Soils policy consultation document aims to incorporate the views of policy managers, operational bodies, land managers and users as to how the measures in the Strategy meet the needs of soil protection and of the policy measures to be implemented. A Strategic Environmental Assessment for the Scottish Soil Strategy will also assess the potential impacts of the Strategy on other related policy programmes and issues such as biodiversity, water, climate, human health, cultural heritage and landscape.

2.3 Deer policy in the wider countryside

Wild deer have a significant ecological role as the largest undomesticated grazers in Scotland. At an appropriate density, deer can contribute to maintaining the natural heritage value of many habitats. They can influence the natural heritage through:

- impacts on plant growth due to grazing and defecation;
- impacts on the growth of woody shrubs and trees due to browsing and bark stripping;
- altering the biodiversity of plant communities, positively or negatively, through impacts on the survival and abundance of plant species;
- impacts on animal species, such as trampling of ground-nesting birds' nests;
- impacts on landscape through changing the composition or character of habitats.³⁴

Legislation and strategy

Although deer are free to roam across ownership boundaries, it is provided for in common law that land owners have a certain right to shoot deer on their land. The **Deer Act (1991)**³⁵ consolidates previous legislation in England and Wales specific to deer, whilst the **Deer Scotland Act (1996)**³⁶ does the same for Scotland. Statutory enforcement through these Acts includes stipulating 'close seasons' during which deliberately injuring or killing a deer is illegal, the prohibition of night shooting, and making it an offence to sell any deer killed unlawfully, or use an un-licensed dealer. The Deer Scotland Act led to the creation of the statutory body the **Deer Commission for Scotland (DCS)**³⁷, sponsored by SEERAD, in order to further the conservation, control and sustainable management of all species of wild deer in Scotland, as well as reviewing all matters, including welfare, relating to deer. The DCS's strategy brings together the wider influence that deer have on Scotland's environment, rural communities and businesses, and people's well being.

Deer management does not come under any statutory framework, hence is not currently subject to planning or development controls. However, concerns over deer-related damage to the natural heritage at a site can be raised by the DCS or brought to their attention by the owner, occupier, SNH, FCS, or a non-government group or individual (Box 7). Historically, the DCS is likely to consider deer density to be most important when impacting a nationally or internationally important feature within a designated site. However, there is a statutory duty to recognise the importance of the wider landscape in managing habitats and species that cross management boundaries (Habitats Directive). This, plus the need for sustainable deer management within a healthy socio-economic community, is being addressed within the DCS strategy consultation 2007-2008.

Deer management

Deer Management Groups (DMG) have been formed by geographically-aligned land managers and stakeholders, that have access to a discrete population of deer, in order to aid deer management and help meet the requirements of legislation. These groups are voluntary and approximately 70 DMGs exist in Scotland. A minority of estates are not part of a DMG, and so not committed to group objectives.

As well as enforced legislation, collaborative deer management to prevent damage to the natural heritage at a local level can involve the DCS, FCS and SNH in developing voluntary **Deer Management Plans** with land owners and occupiers. Under the Deer

Scotland Act, the DCS can also agree voluntary measures with land managers and DMGs through **Control Agreements**³⁶ that influence their actions in terms of deer density or damage-related issues through implementing specified control measures. If a Control Agreement cannot be secured or carried out, then a Control Scheme may be established which has statutory enforcement capability, and Emergency Measures such as culling employed, although these would only be used in restricted circumstances.

To inform land managers and DMGs, the DCS has produced a series of **Best Practice Guidelines**³⁴ on a wide range of topics, including damage assessment, woodland design and collaborative culling. In 2004, the DCS formed a **Deer Interagency Liaison Group (DILG)**³⁸ to allow Joint Agency Working in collaboration with SNH, FCS and SEERAD. The purpose of the group is to unite the expertise and regulatory powers of each agency toward achieving unified policy objectives where all affected interests are considered. It intends to more clearly express public objectives when dealing with adverse impacts to the natural heritage and agriculture, using incentives and regulation, and is principally applied to designated sites. For this to be effective there needs to be a system in place that allows the stakeholders to recognise private as well as public objectives, and is able to facilitate agreement to achieve these within the regulatory framework.

Box 7

Under the Deer Scotland Act, the DCS uses the following stages to evaluate deer impacts at a site:

- Determine the extent to which the cause is deer, not sheep, cattle or other factors.
- Assess deer impacts using appropriate methods (for example see box 4, 5).
- Judge whether damage to the natural heritage is occurring and if so, if it is serious.

Information that may be used for the above evaluations includes:

- Previous surveys, monitoring, and aerial photographs to examine change.
- Data on numbers of deer, sheep, cattle.
- Proportion of trees showing leader damage.
- Using grazing impact assessment techniques and reports.
- Dung plot techniques for relative changes in deer occupancy.
- Compare grazed and ungrazed areas, such as fenced grazing exclosures.
- Consider site management objectives.

Reference: Damage by wild deer to woodland and the natural heritage. DCS/SNH/FCS Report.

Also see: MacDonald A., *et al.* (1998) A Guide to Upland Habitats Surveying Land Management Impacts, Vol 1 and 2. Perth, SNH.

Farmers and foresters are the main land-owner groups affected by deer-related impacts brought on by grazing and trampling of pasture and crops. However, they are afforded a certain degree of control through exemptions that enable them to shoot deer out of season in an attempt to prevent damage to their yield. The FCS is closely involved in deer management at strategic as well as 'grass-root' level. Issues relating

to deer impacts have been included in the FCS Scottish Forestry Strategy, and deer management is considered amongst the Commission's key objectives.

Links with other policies

Although deer grazing is mentioned in relevant HAPs, RDCs, and signs of herbivore grazing are frequently referred to as indicators of habitat condition (see Section 2.1.3 Indicators of Conservation Status), there is no direct mention of deer or their impacts within the WFD or draft Soils Directive. However, indirect links can occur between deer management and water and soil quality. For example, high densities of deer can result in damage due to trampling and cause peat erosion. This may cause a release of sediment into a water body, causing problems of water silting and reducing its ecological status. Similar problems could arise from sheep or farm vehicles. Locally, therefore, deer densities in the uplands may be enough of a problem to threaten the objectives for a nearby water body, and so appropriate management strategies would need to be incorporated into local management plans, linking with effective habitat management. Although deer management is not directly associated with the legislation and requirements of the WFD and Soils Directive, it may at a local level play a part in achieving their objectives.

Deer management is also impacted by legislation through the Food Standards Agency Scotland. **The Food Safety Act (1990)**, extended by **The Wild Game Meat (Hygiene and Inspection) Regulations (1995)**³⁹, secures compliance with relevant EU legislation. Together these necessitate compulsory inspection of the deer at a number of key stages when the animal is killed and destined for the food chain, and the registering of premises such as game larders. This may create increased costs associated with compliance, but help to achieve this could facilitate land managers in their objective to cull and market the appropriate number of deer to achieve the natural heritage objectives.

3. Implications of landscape regulations for land managers

The complex network of landscape and biodiversity policies within the UK and EU, either linked together or operating independently, has led to the involvement of many statutory and public bodies with their own separate objectives. There needs to be a more co-ordinated approach to help land managers know what legislation may impact their activities and where to find simple guidance for how to meet their aims and requirements. There are many guidance notes and tables of indicators produced by statutory agencies such as DCS, SNH and FCS for assessing and monitoring deer impacts. But this may be confusing to land owners who are not sure of what legislation impacts them, who to consult and what the best methods of monitoring are. The DCS has produced a clear set of Best Practice Guidelines³⁴ for a number of areas of deer management that include assessing impacts on habitats, as well as for good deer welfare. Increasingly, there is a need to link these potential impacts with other policies affecting the wider countryside such as the WFD and landscape planning.

The following Case Study will examine how landscape policy impacts land managers within Scotland, focusing on the role of deer within this framework. The Case Study will use the natural heritage of West Sutherland as a landscape to illustrate generic issues, but the area of the Case Study site itself and associated management issues are fictitious and not necessarily relevant to West Sutherland. The aims of the Case Study are to address the following questions:

- 1) What regulations (national and local) impact deer management within the area of the Case Study?
- 2) Are there any conflicts between the different regulations for land managers?
- 3) How might deer management impact the outcome of this legislation?
- 4) Are currently available indicators used to measure deer impacts suitable and available?

3.1 Case Study

The following example will explore landscape issues and potential conflicts within the context of a fictitious area in the north west of Scotland, managed for deer.

SNH Characterisation of the Region

The region is categorised as the 'North West Seaboard' within the SNH Natural Heritage Futures (NHF), for which the objectives are listed in Box 8. It is characterised by a mix of mountain and moor, pine and deciduous wooded straths, freshwater and marine lochs. Much of the land is under private ownership as sporting estates for deer stalking and fishing. The key influences on land include changes in agricultural practice that have led to increased reliance on sheep, muirburn reducing habitat condition, and grazing levels sufficient to prevent woodland regeneration. However, recent changes in agricultural subsidies have led to decreased stocking of sheep on many land holdings.

Current grazing pressure has caused localised loss and deterioration of some upland grazing-intolerant communities such as heather moorland and calcareous grassland, and prevented woodland regeneration. In a few areas, localised trampling and erosion is thought to be due to artificially high deer numbers created by supplementary feeding. Much of the woodland resource is badly fragmented, so areas with a larger Core Forest Area will be encouraged to expand to maintain an optimum size for

retention of woodland species. Many landowners in areas of existing woodland have taken up native woodland forestry schemes. There has also been increased tourism and demands for infrastructure; renewable energy schemes and commercial forestry. As well as better integration for land management with wider rural sustainable development objectives, SNH's regional characterisation recognises that there is a need within the region to reduce numbers of deer and sheep to levels that will improve the condition of grazing-sensitive habitats, and allow natural woodland regeneration.

3.1.1 Overview of relevant legislation and objectives

Within the region, the Case Study focuses on an area of land within one deer estate (Fig 2). The estate would have to comply with a range of legislation relating to deer, the natural heritage, rural business and planning. However, many land managers would have little or no knowledge of this legislation, ecological designations, or the implications that it may have for land management decisions. An overview of the legislation that would impact the estate management is given below, whilst more detail of the policies and objectives can be found within **Section 2** of this Report.

Deer as a rural business

Management of the estate would have to comply with the Deer Scotland Act, The Food Safety Act and the Wild Game Meat (Hygiene and Inspection) Regulations for the sustainable management and welfare of deer and production of venison. If the land manager were a member of a Deer Management Group, they may be part of an agreed Deer Management Plan. However, deer management itself does not come under any statutory framework and so is not currently subject to planning or development controls.

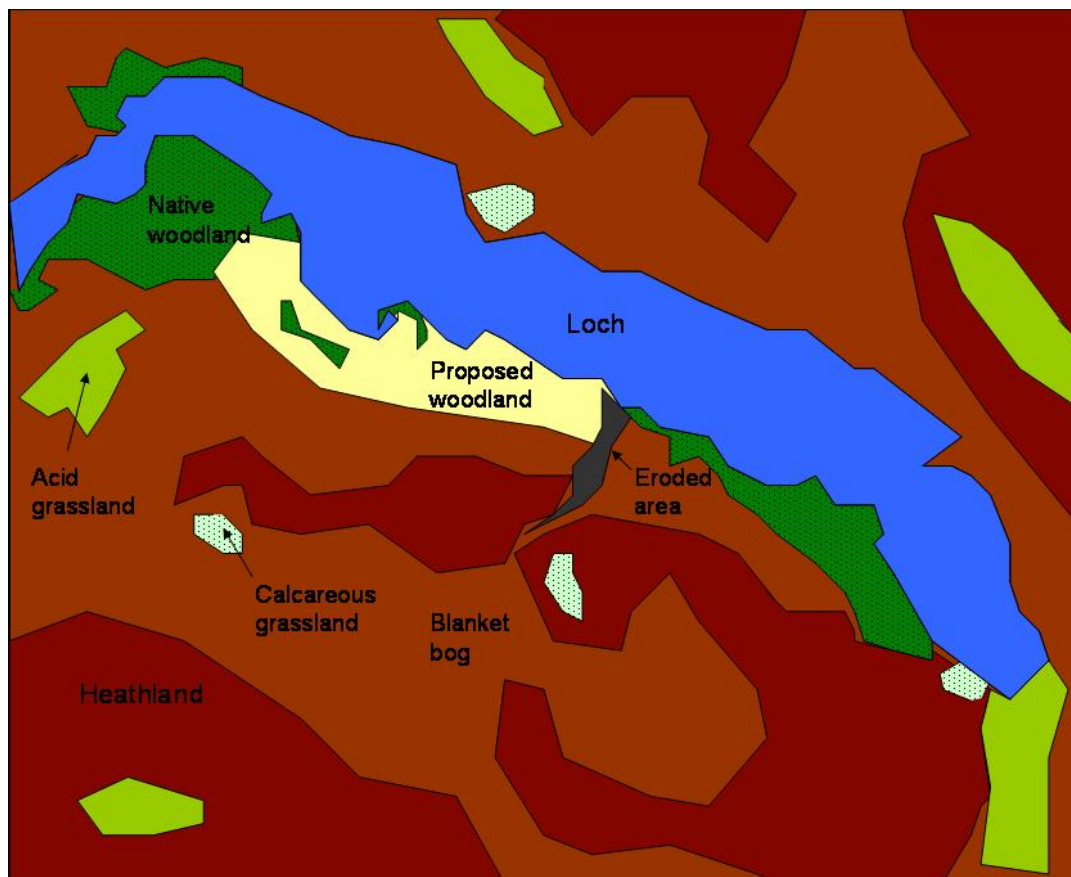


Figure 2. Fictitious map of site and habitats. Steep slopes of upland heathland, blanket bog, and isolated outcrops of acid and calcareous grassland, leading down to scattered pockets of native forest on the banks of an oligotrophic loch.

Natural Heritage - Habitats and Species Directive and UKBAP

The Habitats and Species Directive, Birds Directive, and the UKBAP, HAPs and SAPs would impact relevant species and habitat management at the site. (HAP objectives for a selection of the site's Broad and Priority habitats are listed in Appendix III, Tables 1 to 3.) In non-designated areas there is an obligation for statutory bodies and competent authorities, under the EC Directives, to monitor habitat condition and carry out UKBAP objectives particularly for Priority species and habitats, as well as to protect species listed under the Wildlife and Countryside Act. The site's upland habitats and woodlands fall within the requirements of the Scottish Biodiversity Strategy's Implementation Plan and Scottish Forestry Strategy to help achieve HAP and SAP targets of principal importance in Scotland, to enhance and extend habitats such as native woodland, and secure favourable site management through encouraging adoption of best practices that link biodiversity with sporting and land management aims. The land manager is also legally required to assess the site for European Protected Species, such as bats and otters found in woodland or lochs for which the relevant SAPs would apply, and to assess the likelihood of the impact of management operations on them.

EC directives and Scottish Regulations would have an overriding authority to affect development proposals at this non-designated site if it was thought that they would detrimentally affect Priority species and habitats. International statements on protecting the natural heritage and UKBAP objectives for the wider countryside are often not followed up by effective national and local enforcement strategies.

Agri-environment Schemes

Agri-environment incentives for upland areas centre on the LMO and RDC Schemes with SEERAD, which include options to improve woodland management and public access, and to establish management of moorland grazing that benefits Priority habitats. They can operate on either a non-competitive basis where the land manager chooses a management option from a list of funded actions, or presents a management proposal on a competitive basis to gain funding.

Landscape Planning

The local authority considers any planning or development, which must follow the Scotland's statutory obligations and policy guidelines for conservation of the natural heritage in non-designated areas. It must also follow the Strategic Environmental Assessment Scotland protocols for sustainable development and use of biodiversity.

The area falls within the Caithness and Sutherland LCA, which includes recommendations for a reduction in grazing levels to prevent deterioration or loss of grazing-sensitive habitats. There is specific mention of woodland design, and removal of deer, either through fencing or husbandry, to allow woodland regeneration. Within the Highland Region Structural Plan (2001), all land use proposals will be assessed for their compatibility with the present LCA and NHF reports, and used to inform local planning decisions, forestry, infrastructure, agriculture, electricity and telecommunications. The Plan, in partnership with the statutory agencies, aims to encourage the development of a diverse, multi-purpose forest resource that creates local employment opportunities, complements the landscape, enhances public access and recreation, as well as helping to sustain local wildlife and safeguard the quality of river and loch systems. It also encourages the conservation and expansion of specifically native woodland. Areas thought appropriate for woodland planting have

been identified, depending on constraining interests such as local planning, suitable habitat, and existing forest network within the areas, and so any expansion of native woodland (birch, oak, pine) would be encouraged by the Highland Council within the area included in this Case Study.

Water body

The water body and its catchment at the site would be assessed by SEPA as part of the Scottish RBMP (Appendix III, table 4) under the Water Framework Directive. SEPA are required to assess and monitor water bodies, particularly those that do not meet the target reference condition, as part of the WFD objectives to improve and support sound and sustainable water management that balances environmental, social and economic needs. This includes an assessment of the pressures on water quality and ecological status of the water body, and any resulting impacts.

Soils

As the Scottish Soil Strategy is under development, it is not yet possible to describe what it will require of land managers.

Box 8

Natural Heritage Futures objectives and actions for the North West Seaboard, relevant to deer management, intended to provide a landscape-wide approach and improve co-ordination between biodiversity, planning and landscape character:

Natural Heritage

- **Maintain existing upland habitats**
Ensure implementation and monitoring of deer management plans that consider natural heritage interests, together with reduction of stocking on hill land. Increase culls of deer and monitor how changes of agricultural payments influence sheep numbers. Promote the muirburn code and incentive schemes for moorland management. Monitor and manage visitor impacts.
- **Secure widespread recovery of existing native woodland by natural regeneration and encourage new planting of native woodland where appropriate**
Develop a forest strategy that incorporates a forest habitat network of linked core forest areas including native woodland expansion and restoration. Achieved through targeted incentive schemes and discourage use of deer fencing for schemes. Accommodate open ground habitats and species, and reflect the Landscape Character Assessment for the area. Integrate woodland with other land uses such as shelter areas for deer management, as well as with local access.

Landscape Planning

- **Balance landscape character with needs of land managers, visitors and communities** Develop the Nationally Scenic Areas management strategy, and ensure landscape issues are fully considered as part of development plans and strategies (eg telecommunications, windfarms, rural housing). Ensure all developments follow NPPG 14, and woodland planting follows assessment of landscape impacts, UK Design Guidelines and takes into account access needs. Prevent track erosion from all terrain vehicles. Support renewable energy developments where compatible with the natural heritage.

Water body

- **Maintain river catchments and their natural processes, improve water quality and riparian habitats**
Develop a catchment-based approach to address land management practices such as forestry and grazing, riparian habitat restoration through improving woodland and bankside vegetation.

3.1.2 Mechanisms to achieve local landscape objectives

This section describes the mechanisms available to implement local landscape legislation and natural heritage objectives relevant to deer management for the fictitious case study area. It discusses how deer management at the site may impact these objectives and targets. Where relevant, prescriptions and subsequent actions for land managers are mentioned as either *voluntary*, *negotiable* or non-negotiable.

Deer policy and natural heritage objectives

Deer Management Plan *voluntary*

Grazing is an important mechanism for maintaining favourable condition of many heather-dominated and species-rich grassland habitats. It is also important for a land manager to ensure that the site's habitats provide adequate forage and shelter for deer. A land manager can monitor deer numbers and ensure that they are sufficient to prevent habitat deterioration through undergrazing or overgrazing by agreeing a *voluntary* Deer Management Plan for both the deer and their habitats at the site in consultation with DCS, FCS and SNH.

Deer Scotland Act Control Agreement *voluntary and negotiable*

Under the Deer Scotland Act there are provisions to prevent damage to habitats as a consequence of deer presence. If it was believed that Priority habitats or species at the site were under threat of damage by deer densities, and the current Management Plan was either ineffective or being ignored, the DCS is authorised to visit the site to carry out a site assessment and develop a Management Plan and Control Agreement in co-operation with the land manager. They would *advise* the land manager of the necessary action they should take to prevent further damage to the natural heritage. A key part of this would be to cull deer to a density thought appropriate to avoid further habitat deterioration, whilst at the same time recognising and enabling other land management interests to continue. The Agreement might also require deer removal by diversionary methods to avoid trampling damage to areas prone to soil erosion and run-off into a nearby water body (see *Water Body* section below). The DCS can provide the land manager with Best Practice Guidelines on wide ranging issues including deer welfare, habitat damage assessment, woodland design and collaborative culling. The agreed actions would become non-negotiable where there is concern over continuing habitat degradation.

Deer Scotland Act Control Scheme non-negotiable

If the land manager does not follow the requisite Control Agreement actions through, the DCS may enforce a compulsory Control Scheme. To support management agreements with the land manager, the DCS will provide Best Practice Guidelines, financial assistance if deemed absolutely necessary by the DCS board and SEERAD, and advice of any other funding sources for the work. Although in theory Control Schemes can be enforced where land managers do not take the appropriate action for managing deer numbers, causing continued damage to the natural heritage and deer welfare issues, these have never been tested in full. Assessments have always concluded that the prospects for success were low and that risks, costs, timeframe and likely outcomes would be unlikely to justify its use.

Natural Heritage policy

LBAPs *voluntary*

A broad example of natural heritage objectives for the region can be seen in Box 8. The LBAP^{12, 40} details more specific local targets to achieve these policy objectives

for an area. Achievement of these relies upon *voluntary* agreements by the land owner. Under the UKBAP and HAP targets, the site manager would be *encouraged* by SNH and DCS to maintain deer at a density that would allow enhancement of the heathland and bog habitat and associated Priority species. Actions to help achieve natural heritage policies rely on the *voluntary* co-operation of the land manager through management plans, agreements and financial incentive schemes. These include agri-environment and forestry schemes to help protect, enhance and expand UK Broad and Priority habitats (see *Agri-environment Schemes* below). Statutory agency staff are currently focussing on the relatively clear objectives for the condition of Natura 2000 sites. However, it is a perception by some working within the agencies that although there are statutory obligations to develop management actions to deliver the policies and objectives for the wider countryside, effective means of articulating these objectives to land-owners and managers has not been developed. In addition, it is not clear that current legislative powers for both enforcement and incentivisation are appropriate for the achieving objectives with private landowners/managers in the wider countryside

Agri-environment Schemes – Rural Development

There is no obligation to take up agri-environment schemes, therefore they are *voluntary*. However, once entered into the agreement is non-negotiable as compliance is compulsory and land managers may face repayment demands or fines if they do not follow scheme requirements.

RDC Tier Schemes

The Tier 1 Single Farm Payment Scheme secures a basic level of environmental protection and animal welfare, supporting arable, beef and sheep farming. The Tier 2 menu options only list sheep, cattle and farmed rather than wild deer as grazers for which payments can be received towards management of moorland grazing through shepherding, managing livestock and feeding practices. It is likely that Tier 3 will be developed to provide an incentive option that supports wild deer management in order to maintain or enhance natural heritage on moorland and woodlands, although this scheme is competitive and not offered as a menu scheme. Specific grants for woodland management such as the Scottish Forestry Grant Scheme will also be administered through RDCs.

Forestry Schemes

The land manager is not obliged to approach a statutory agency for woodland assessment; however this would be necessary if they wished to receive financial support. For existing woodland, an assessment of grazing, carried out by the FCS, would indicate if the habitat was at risk of deterioration through overgrazing or undergrazing, and identify actions to meet the requirements of the relevant HAP. If deer numbers were high enough to damage and prevent recovery of the woodland and associated species, it may be necessary for the site manager to develop an appropriate Deer Management Plan with the DCS and enter into a Control Agreement. Deer could be excluded from the woodland either by erecting fencing around the habitat, or by localised culling to reduce deer to a density thought appropriate to avoid further habitat deterioration. Any threats to the conservation of EPS and Priority species such as bats may also be identified by the FCS or SNH. If the land manager entered an agreement with SNH and FCS to allow natural woodland regeneration between the existing areas of native woodland, deer numbers would again need to be controlled in the target area if the existing grazing pressure prevented natural regeneration and a

mixed forest structure. In some regeneration areas, enrichment planting of appropriate species may be needed.

Support to develop appropriate woodland planning and management can be provided through the LMO Menu Scheme, and this will help the land manager apply for financial support through the Scottish Forestry Grant Scheme and future RDCs. This provides payments to maintain a minimum level of protection to avoid damage to the woodland through undergrazing or overgrazing, for example the RDC Tier1 Single Farm Payment Scheme for establishing new woodlands. These schemes assist with the costs of fencing or reducing the density of grazers impacting woodland, and planting to create new woodlands. Any plans to develop the forest network would be required to follow Structural Plans, NPPG14 and fit in with the LCA and NHF for the area (see *Land use planning* section below).

Take-up of these schemes would rely upon how pro-active the local statutory contact is in communicating available options to the land manager. Often there is very little direct encouragement, relying on word-of-mouth between land managers, and scheme forms can appear confusing with a risk of making mistakes which could be penalised. Management of deer grazing impacts for achieving the objectives of agri-environment schemes such as RDCs are important not just within the site but also for any schemes entered into by surrounding land managers. This can be helped by co-operation within DMGs and associated management plans.

Land-use planning

Structural Plans and Strategic Environmental Assessment non-negotiable

Permission must be obtained from relevant authorities for any proposed development at the site, and the planning authorities would be required to assess any proposal, for example a building, track or car park, against the Highland Region Structural Plan. Planning authorities must also ensure that it meets the recommendations of the NPPG14, and the LCA and NHF descriptions for the area. The Planning Policy Guideline NPPG14 advises relevant authorities to avoid habitat fragmentation, promote an integrated habitat network, promote environmental development schemes and avoid harm to UKBAP Priority species and habitats. For example, any plans to develop the forest network would need to be assessed against these recommendations. As the Structural Plan encourages the conservation and expansion of native woodland, and its use for local employment and recreation, it may be supportive of the need for more infrastructure to support a multi-purpose forest resource. However, all planning must also follow the Strategic Environmental Assessment Scotland protocols to ensure sustainable development that also allows sustainable use of biodiversity. Support for land managers is offered through the agri-environment schemes.

Water bodies

RBMP *voluntary*

If there is concern that the water body does not meet the RBMP objectives, appropriate action to improve its ecological status will be *advised* by SEPA through an Area Management Plan developed with local stakeholders. For example, sheltered areas can attract a high density of deer with subsequent problems of trampling and peat erosion, (see Fig 2). This may result in run-off that has become contaminated with organic sediment entering the loch, causing diffuse pollution and reducing water quality. As a requirement of the WFD, SEPA must carry out a pressures and impacts assessment for the water body. If the diffuse pollution was considered to affect

aquatic species and place the loch in poor ecological status, the site manager would be *requested* to take action to avoid further deterioration and aim to improve the loch towards good ecological status. This may be achieved by a management agreement to cull deer or diversionary methods to avoid trampling damage to areas prone to soil erosion and run-off. Any plans to stabilise banks and enhance riparian communities through planting deep-rooted trees would have to consider the impacts of deer grazing and local Deer Management Plans on the scheme's success and on Catchment Management Plans. Support and incentives to act upon the aims of the RBMP include funding through schemes such as agri-environment RDCs, as well as voluntary agreements, training schemes and best management practices agreed with statutory bodies.

3.1.3 Pressures and conflicts between different regulations

The complex incorporation of landscape and biodiversity legislation into EU and UK policy may not only be confusing to agencies and land managers alike, but can lead to policies with conflicting objectives. This section will examine potential pressures and conflicts between regulations using the Case Study site as an example. It is important to note that the following examples do not preclude any positive interactions also possible between the policies listed.

- **Maintaining favourable condition, enhancement and restoration** (e.g. HAPS, SAPS, NHF, Scottish Forestry Strategy)

Within a grazing animal range, there are potential conflicts between the grazing management required to maintain favourable conservation status or prevent the deterioration of different upland habitats and their associated species. For example, the density of grazing animals (deer or sheep) needed to prevent overgrazing and loss of heather on heather moorland, may be too low to maintain habitats such as herb-rich calcareous grassland which support faster-growing species that need greater grazing pressure. Therefore, conflicting management recommendations and advice for upland areas can occur between HAPS, as well as between SAPs. It is important to recognise that the management required to maintain or protect one habitat or species, may have consequences (positive or negative) for others, when translating natural heritage objectives into management.

This also needs to be considered for UKBAP targets that include enhancement and recreation of Priority habitats. For example, the Scottish Forestry Strategy aims to forest 25% of Scotland, with HAP and NHF objectives promoting the establishment of native forest networks through the enhancement, extension and restoration of native woodland. Whilst the objectives for heathland are to maintain and enhance habitats, promote the recovery of areas lost to past afforestation, and avoid habitat fragmentation. Expansion of one habitat, such as native forest as seen in fig 1, may cause the loss or fragmentation of another Priority habitat. Judgements therefore need to be made as to how to prioritise habitat targets within an area, whether HAPs are mutually exclusive or can be incorporated as habitat mosaics, and as to what scale management plans need to operate. Natural heritage strategies need to recognise that habitats occur as mosaics and ecotones rather than seeing them in absolute terms, and this translation of general policy has to be carried out by local agency staff. Any change in habitat type must also not contravene the Wildlife and Countryside Act, and detrimentally impact national and internationally protected species

- **Grazing management by deer fencing, culling or shepherding** (e.g. RDC, NHF, LCA, Scottish Forestry Strategy)

There is much debate over the methods used to remove grazing pressure in order to aid woodland restoration and regeneration. If the current grazing pressure is thought to be preventing regeneration, incentive payments, for example through agri-environment schemes such as RDCs, have often supported erection of fencing around the woodland to be restored or area set aside for natural woodland regeneration, alongside culling deer that were reliant on the fenced area. However, this conflicts with the NHF policy to discourage the use of deer fencing.

Although fencing to exclude deer would remove grazing pressure on woodland species, it can create problems by making shelter areas inaccessible for deer and increases the potential for bird strikes against the fencing. Deer fences can be a significant factor in the mortality of birds such as black grouse and capercaillie. Additionally, lack of grazing within fenced areas can result in ground vegetation and scrub becoming too thick for tree seedlings to establish. The resulting build-up of vegetation litter may also present a fire risk.

The alternative to fencing is increased deer culling if deer have been identified as the principal grazer within the woodland. However, this does not automatically result in grazing pressure that has been reduced sufficiently in the required location to allow woodland recovery or regeneration. It may also result in other Priority habitats, such as upland calcareous grassland, deteriorating in condition due to under-grazing. Additionally, any requirements for the control of deer numbers must acknowledge that a deer estate manager needs at least the minimum number of deer to maintain a sustainable business. If the site manager agrees to grazing management by culling and aims to use the increased cull size for venison, relevant practices and infrastructure must comply with the regulations of the Deer Scotland Act, The Food Safety Act and the Wild Game Meat (Hygiene and Inspection) Regulations. For example, culling practices may have to incorporate inspection of the deer at a number of key stages when the animal is killed and destined for the food chain, as well as registering game larders.

- **Woodland regeneration and loch ecological status** (e.g. Scottish Forestry Strategy, HAP and WFD)

Objectives for woodland regeneration from the Scottish Forestry Strategy, woodland HAPs and NHF (described above) must avoid conflicts with the requirements of the WFD. Woodland regeneration or creation is likely to alter the local hydrology, influence water chemistry and may positively or negatively affect riparian and aquatic communities. This will have consequences for the pressures and impacts assessment of the water body by SEPA and may alter its ecological status. Additionally, creation of new woodland or linking forests may alter deer behaviour. If areas have been fenced for regeneration, the deer may be forced to find shelter or forage in other locations less able to support the deer density. Potential habitat deterioration, soil erosion, run-off into the water body and inadequate shelter for deer, are failures to meet the requirements of the UKBAP HAPs, WFD, Soils Directive and Deer Scotland Act, respectively.

- **Farm management, sustainable rural economy and the natural heritage** (e.g. CAP reform, Scottish Biodiversity Strategy, WFD)

Any future alteration of the CAP and payment reforms will influence the scale and type of farming in the region. As a result, land managers may decide to change the

area of land that is under grazing management for both deer and sheep. This may result in increased grazing and trampling pressure in vulnerable habitats and locations, causing habitat damage and possibly greater erosion and release of sediment into the water body. Such an outcome would conflict with the Scottish Biodiversity Strategy, HAPs, and WFD aims to conserve, enhance and achieve good ecological status of upland habitats and water bodies. Although CAP reform may lead to a reduction in the density of hill sheep, this may merely allow the site to support a greater density of deer, and so the Deer Management Plan, impacts on habitats, and any Control Agreements with the DCS would have to be re-examined.

Any requirements for the control of deer numbers must acknowledge that the land manager needs to run the site as a business. To be interested in making the required changes to estate management, land managers must be adequately rewarded or compensated. Therefore, a natural heritage-driven policy to reduce deer numbers, for example to allow natural woodland regeneration, may put pressure on the needs of the land manager for at least minimum numbers of deer to sustain an economically viable business.

- **Rural recreation and the natural heritage** (e.g. Structural Plans, LBAP, NHF, LCA)

The Scottish Forestry Strategy, Highland Region Structural Plan and NHF encourage development of a multi-purpose forest resource that allows tourism and recreational access as well as employment opportunities. This may involve the need for a new access track to the forest, picnic or car park area, which would have to be assessed against the needs of local protected species, Priority SAPs, EPS and the Wildlife and Countryside Act. Planning better infrastructure and local sustainable development (housing, forestry as income, renewable energy) has to be balanced against natural heritage directives and UKBAP targets, and this should be considered by the planning checks currently in place. New infrastructure and use of the woodland resource for recreation may force deer to find shelter or forage in alternative locations less able to support the deer density. Therefore, consideration needs to be given as to how the proposed development will impact the range and behaviour of the herd. Additionally, encouragement of recreation and tourism may conflict with the LBAP target to prevent damage and erosion from hill walkers. To aid implementation of the above policies there need to be effective methods of support for land managers for building and maintenance works, as well as help to increase visitor awareness of stalking and wildlife care issues.

- **Economy and the natural heritage** (e.g. Strategy Plans, NHF, LBAP, RDC)

The EU and UK are producing new guidelines to promote forest economics, including the use of forests for bio-energy in the light of the need for renewable fuel. The area's NHF aims include support of renewable energy developments and forestry that create employment where compatible with the natural heritage. Any proposed future woodland planting for biofuels, for example of willow, would have to follow the Strategic Environmental Assessment Scotland, NPPG14 and UK Design Guidelines. It would also need to be assessed against the loss of habitats and species, NHF, LCA and LBAP objectives for the area. The woodland development may also be impacted by deer grazing, and so the resulting need for grazing control may clash with the requirements of adjacent land managers and any Deer Management Plan objectives. In other aspects of the economy, such as local employment, income from deer management is beneficial, and this can also be the case for habitat management where deer grazing can play an important part.

- **Assessments and incentive schemes**(all policies)

There are numerous statutory bodies and non-governmental groups that provide advice and natural heritage assessment, for example for biodiversity, catchment management, planning, and agricultural policy. However, the advice given is not always consistent between groups, whose objectives can conflict. A major obstacle to land managers wanting to undertake biodiversity projects is the complexity of environmental and forestry grant schemes, which can be confusing as to what schemes are available and most appropriate, as well as a lack of resources available for agri-environmental works. Where policies conflict it may not be clear which one takes priority, and the agencies and organisations involved often operate separately and have different policy structures, ranging from UK and landscape level to local groups and issues. The need for more joined-up objectives has been identified by the Scottish Biodiversity Forum, Scottish Landscape Forum and WFD. The production of NHFs by SNH has also tried to address this through linking Scotland biodiversity objectives with local objectives and needs.

Additionally, incentive schemes often fail to show joined-up work at the landscape level, for example LMOs are for a land manager's site in isolation, but the habitats and species involved don't operate at this isolated level.

Future stakeholder meetings are vital to raise the awareness and understanding of land managers, and all those involved in implementing wider landscape policy, of just how linked the different aspects of the landscape are. Such meetings will also be essential if land managers are to be brought on board to help achieve natural heritage targets.

3.1.4 Conflicts and suitability of the indicators currently used to measure deer impacts

Using the Case Study site as an example, this section will examine what actions and knowledge are needed to achieve the objectives for the site, and whether existing indicators are suitable and available for land managers.

Gaps in knowledge

Importantly, there is no comprehensive map of Priority habitats in the wider countryside for land managers or agency staff to refer to. The land manager cannot be expected to recognise the different Broad and Priority habitats, but an awareness of the habitats present is necessary in order to identify the site's potential for natural heritage enhancement and eligibility for grants. Therefore, before evaluating habitat condition and setting targets for a site, the first challenge is to identify where the Priority habitats are. This lack of information is highlighted in the Sutherland LBAP, which describes the following gaps and constraints to its implementation: lack of biodiversity audit information on habitats and species for Sutherland; no funded and staffed Biological Records Centre for the Highlands, and enormous gaps in knowledge of the biodiversity of Sutherland.

Just as the different policy objectives may conflict, there can also appear to be a lack of clarity as to the appropriate indicators of deer impacts. Different agencies may use varied sources of information, such as internal reports and research documents, for compiling lists of indicators for a range of habitats (see Appendix III). Each can suggest different deer impact indicators for the same habitat, although variation can sometimes be due to different indicators being required to assess either habitat

condition, grazer impacts or for research purposes. The agencies often have their own methods of assessment, and the advised indicators within one agency can change with time as better indicators and methods are developed. Therefore, although generally in agreement, the different sources of habitat indicators and assessment methods can also give conflicting advice. For example, one source lists < 2% and one lists < 10% bare peat as acceptable condition for blanket bog. Additionally, using percentage cover by eye as a method of assessment can be subjective and lead to large variation between surveyors. Care also needs to be taken by the surveyor as to what indicator list is being used, especially as the assessment methods are not always comparable; for example, different quadrat sizes and time of year for assessment. Therefore, the whole process of identifying habitats, agreeing indicators of their condition, and also deciding upon conservation priorities within and between habitats, can be extremely subjective and sometimes lack agreement.

Many indicators are qualitative and comparative, and would need regular monitoring to assess the outcomes of management changes. The desired frequency for monitoring habitat impacts is often not clear to land managers in assessment methodologies or grant schemes. In order to assess grazing impacts the type and numbers of herbivore causing the detrimental impact would also need to be identified. This is often difficult, and there are few management guidelines for appropriate deer numbers, although agreements would also need to be site specific. As well as a limited understanding of the direct impacts of deer density on habitat condition, knowledge is also often lacking on the indirect impact that deer numbers have on the survival of other species. For example, in a habitat jointly utilised by deer and black grouse, heavy grazing pressure by deer may alter the vegetation such that the black grouse are unable to survive. To better understand such interactions, long-term monitoring is needed to judge whether altering deer numbers had the desired effect on the performance of a species relative to its general performance elsewhere.

Land manager participation in assessments

With more pressures on agency time, there will be increasing onus on the land manager to carry out an assessment of deer impacts on habitats. Land managers would be required to understand a range of assessment and monitoring techniques, as well as terminology, for different habitats and species. If this is to be effective, conservation agency habitat categories need to be translated by stakeholders in order to make the categories and terminology accessible and practical. The DCS Best Practice Guidance attempts to communicate species identification and assessment methods, but much is expected of the land manager who might find many aspects confusing. These issues could be resolved through stakeholder involvement in development of and training in the use of the Best Practice Guidance.

Mostly, the statutory agency indicators and methods have been developed for use on designated land, but these are not necessarily used or are appropriate for the wider countryside. Getting private owners to take part in habitat condition assessment and monitoring is also more important for non-designated land. Rather than being forced into action through threats of penalisation, land managers must be a part of the decision making process in relation to a site's condition, and help develop effective indicators of impacts in order to encourage co-operation. It may then be easier to encourage land managers to become involved in the conservation of biodiversity and meeting of landscape targets. Simplifying ecosystem indicators through this process could lead to creation of a system for habitat condition in the wider countryside, based

on more broad and practical favourable condition indicators.. **Broad scale condition indicators** provide a way of setting distilled biodiversity standards which can be easily used to monitor sustainable land management and ‘broadly’ reflect ecological condition on a landscape scale. The need for such indicators is recognised by statutory agencies ⁴¹. Avoiding complex indicators would enable land managers to carry out their own monitoring and know under which conditions their land management is not contrary to public objectives.

Additionally, land managers are running a business, and so need incentives to gain the required skills and put aside the not inconsiderable time needed to develop and carry out such assessments. Incentive schemes need to avoid using complex terminology, and confusing and subjective statements that may prevent land managers from applying; for example, clearer descriptions of what is meant by ‘damaged’ or by the ‘importance’ of the habitat in the existing landscape.

Effective condition indicators and monitoring methods must, therefore, be formed from a mix of quantitative evidence, landscape quality and the expert opinion of land managers. Increased involvement of land managers may also help clarify which objectives are negotiable and which are not. Furthermore, current conflicts between policies, for example management requirements, monitoring regimes, different policy aims and structures, suggest the need for merging methods in order to create the most cost-effective implementation of the raft of objectives for the wider countryside.

4. Suggested solution for managing diffuse deer impacts

In order to aid implementation of wider landscape policies and deliver specific objectives, statutory bodies and organisations have typically developed their own assessment approaches, either for their officers or the land manager to carry out. This has led to a number of different methods and advice offered to land managers, adding to the confusion of which legislation impacts them and which resulting actions are required. It may be too complex to have a one-stop-shop for all policies that affect the wider countryside, but land managers need to know which legislation may impact their activities, and then where to find simple guidance for how to meet their aims and requirements.

Current examples of assessment methods for threats to the natural heritage include:

DCS and SNH Evaluation Process presents a flow diagram demonstrating the procedures followed by SNH and DCS staff after a site has been highlighted as potentially being *damaged* by current grazing pressure.

DCS Best Practice Guidance including deer planning and *assessing impacts* on upland habitats. This lists key indicators, monitoring methods and guidance on assessing results, and is intended for land managers to use for their own assessment of deer impacts.

DEFRA, FCS, Forest Research and English Nature judgement based method for identifying overgrazing in native woodland. This presents a question-based approach to *condition assessment*, and develops the idea of an ‘expert’ decision tree, to derive the ‘assessment class’ of the woodland and evaluate the implications of this for future grazing management.

WFD RBMP Characterisation and Impacts Analysis where SEPA reports on the quality status of a water body and, if there is potential for this to be at risk, carries out a *risk assessment* based on information of the pressures and impacts on the water body. This identifies if it is failing to meet its environmental objectives. The resulting risk category determines the type of action to be carried out by SEPA. This may include carrying out an appropriate Programme of Measures and operational monitoring until the water body meets the quality objectives; a focus on more detailed risk assessments, or a later review to identify if there have been any significant changes to the situation. If there is an unplanned event that puts the water body at risk, or the reason or knowledge of the exceedance is not clear, investigative monitoring will be carried out. This methodology has been developed by SEPA but as a practice is still in its early stages.

The need for greater integration of planning with other land management policies and incentives is increasingly recognised amongst statutory bodies. A number of working groups have been established to identify the problems, and this now needs to be developed into practical action. Additionally, national planning policies have embraced biodiversity objectives by issuing guidance and advice, but practical delivery at the local level needs more emphasis. The language used at national level is extremely different from that of land managers and those assessing the natural heritage on the ground. This will also add to the complexity and confusion surrounding policies and objectives. Even within an organisation there can be conflicts and confusion between objectives and advice. For example, there can be a lack of co-ordination between SAPs and HAPs, as well as between national and local interests, and this has been flagged up by SNH as an on-going issue. Ideally, land

managers taking an active role in Management Groups could influence the direction and outcome of local legislation implementation. They may also help agencies better understand what are the barriers and best practice for achieving local desirable conditions, and to assist with the development of effective methods of assessment, impact indicators and monitoring.

4.1 Land Management Risk Assessment

The flow-chart in Figure 3 is an attempt to develop a landscape 'Risk Assessment' methodology that establishes a dialogue between land managers and local statutory agencies, compares their management objectives, and enables discussion to agree priorities for action. Through communicating the raft of policies and requirements (from natural heritage to water bodies and planning) to landowners and stakeholders it can also be used to highlight potential management conflicts and any gaps in knowledge within the process of assessments and corresponding actions. It aims to include land managers in legislation implementation, and allow them to take part in decisions on local habitat condition and management objectives, producing a deer management plan that is accountable to both public and private stakeholders.

The Risk Assessment process would involve five steps:

1. Landscape Assessment and Private Objectives

Initially, there needs to be dialogue between land managers and agency staff to establish a working relationship. This may be possible through local DMGs representatives and Joint Agency groups comparable to DILG (a DCS, SNH, FCS group established to deal with grazing management on designated sites). Although this may require quite a time investment, it is likely to aid future understanding and achievement of both private and public management and landscape objectives.

In order to help meet public objectives, it will be important to incorporate the private objectives and concerns of the land manager. To communicate these, a map of the natural heritage landscape at the site could be drawn up by the land manager, together with summaries of their current or proposed management and concerns for any areas. Advice and any practical help to start the process would be supplied by the nominated statutory agency contact. The resulting list of habitats and landscape uses should include social and economic natural heritage uses, objectives and concerns in order to identify all aspects of current private management within the landscape.

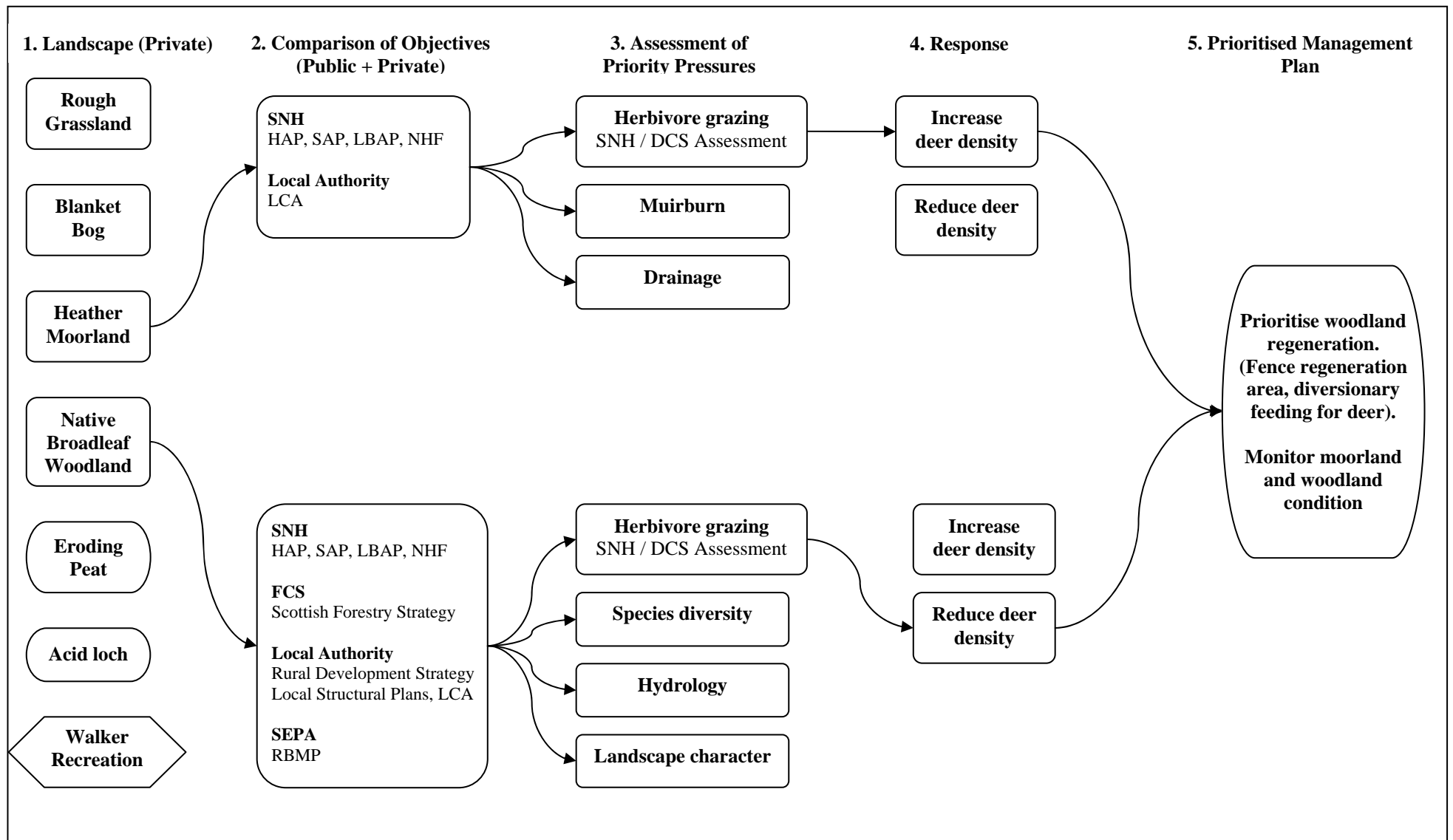


Figure 3. Land Management Risk Assessment: A worked example

What is missing to achieve this: Currently there is no comprehensive map of Broad and Priority habitats in the non-designated wider countryside, and statutory agency staff do not have time within their required duties to produce these maps. Large areas of land are more likely to be mapped and assessed by the land manager if they feel engaged in the process. This would need to be done using habitat categories and terminology that the practitioners are comfortable using at their level of knowledge, developed together with SNH, FCS and SEPA to produce local ‘priority’ habitat maps (see Section 3.1.4 for more detail on developing indicators).

In the worked example (Fig 3) the mapping process for a fictitious site has identified rough grassland, blanket bog, heather moorland, native broadleaf woodland and areas of eroding peat that all support wild deer, an acid loch and access for walker recreation as natural heritage management aspects of the landscape.

2. Public Objectives Assessed with Private Objectives

Agency staff can assess the site map for the likely occurrence of priority habitats and species, and use statutory guidelines to determine LBAP, local objectives, and so site priorities. Examples of methods under development to help prioritise such information and actions include an evaluation of BAP targets, and the Species and future Habitat Action Frameworks from SNH. These, together with the wider landscape objectives such as NHF, LCA and planning, can then be compared with the private objectives and current management at the site. This will highlight potential conflicts both between natural heritage objectives as well as between public and private objectives.

Where there are conflicts between public and private objectives for a ‘resource’ at the site it may be at risk, and so pressures on the resource would need to be assessed on the ground to enable future management to be agreed through negotiation (see step 3). For example, the objective for native broadleaf woodland is to maintain the woodland and prevent habitat fragmentation, but if by mapping the woodland it suggests that it is of poor age structure and fragmented, yet is also important for providing shelter for deer, it is likely to be at risk of deterioration and in need of further assessment.

What is missing to achieve this: Firstly, there needs to be trust between public and private stakeholders and effective communication. There also needs to be available an accessible and clear list of policy objectives, for example for the natural heritage, tourism, and economy, that can then be linked with local issues. Details of the local agencies responsible for implementing policies should be easily available to provide necessary information and advice to stakeholders within this process. The methods employed to prioritise biodiversity actions, where wild deer management may also have an impact, should be flexible enough to focus the broader national perspective by taking into account local issues. They also need to recognise that deer can range over many geographical boundaries.

It is vital that knowledge of how deer management impacts species and habitats is incorporated into the prioritisation of areas and the assessment of whether a resource may be ‘at risk’ under current or proposed deer management. The best outlet for this, e.g. web-based, should be agreed between relevant stakeholders. Currently available Geographical Information System (GIS) maps that help predict factors such as deer densities may also be useful future participatory tools for examining impacts on habitats and thus help to prioritise impact and habitat condition assessments. The **Diffuse Deer Impacts** participatory GIS model has been developed to use existing

maps of habitats and knowledge of their sensitivity to grazing impacts, together with local information on deer density, to predict where pressure from deer may be having the greatest impacts on vegetation. This tool can be used to help set priorities for further assessment of land and deer management.

In the worked example (Fig 3) the resources ‘heather moorland’ and ‘native broadleaf woodland’ have been picked out as examples to show the list of legislation and policies that affect their management and the statutory bodies responsible. In practice, more detail of the public objectives than is shown in figure 3 would be provided for appraisal with the site’s resources and private objectives.

3. Pressures to Achieve Private and Public Objectives

If it has been identified that an area or resource needs further assessment, a list of the potential pressures, either directly on that resource or as a consequence of other management can be used to agree the assessments that need to be carried out. This needs to include pressures and consequences that may be locally specific, and they should be mutually agreed between the land manager and agency staff. For each pressure on a resource there would be information available to the land manager / agency staff as to which statutory body provides the relevant detailed methods and indicators used to assess the identified pressures, causes and impacts. Examples of different pressures on the landscape can include: habitat under or over grazing; poor tree regeneration; soil erosion; sediment discharge into a water body; and path erosion. The results of the assessment would place the resource into an agreed Risk Category, which would then determine the resulting action.

What is missing to achieve this: Although a range of condition and impact assessment methods exists for a number of priority habitats, there is no clear source of standardised methodologies and indicators for each habitat available, and terminology can be confusing to land managers. Additionally, some natural heritage resources have no developed assessment methods. Current methodologies on each habitat and natural heritage resource need to be drawn together in order to give clear assessment methods that can be used by the land manager.

Flexibility is also needed to incorporate local aims, pressures and private objectives in assessing risk to a resource. This needs to be done in consultation with land managers so that there is mutual agreement, development and understanding of the monitoring methodologies used. This approach would also provide an appropriate combination of quantitative and opinion-based impact indicators. A current example of accessible advice for land managers to assess and monitor Priority habitats can be found within the DCS Best Practice Guidelines, but this could be further developed to include terminology agreed by the land manager, and use feed-back to aid practical development of the methods. Not feeling dictated to, but that their local knowledge of the natural heritage is respected and incorporated into its assessment, may encourage the land manager to put aside time to carry out assessments. (For a discussion on conservation indicators and their suitability see Section 2.1.3 Indicators of Conservation Status, and Section 3.1.4 Conflicts and Suitability of Indicators).

In the worked example (Fig 3) the list of potential pressures on the heather moorland and native woodland resources are listed. If the previous comparison of objectives (step 2) highlighted potential conflicts between habitat condition and grazing pressure, this would be subject to a field assessment.

4. Management Response

If the field assessment has identified a degree of risk to the resource or other related resources, the appropriate response needed to reduce this risk and subsequent management methods would be decided in consultation between the land manager and other stakeholders. Appropriate statutory agencies as well as affected land managers would provide current conservation advice and practical input, and could use existing mechanisms such as DMG to develop landscape-scale responses. This consultation would also identify potential clashes in management aims, help further localise and prioritise private and public natural heritage objectives, and agree the selected management measures. To be effective, the agreed objectives need to be clear as to the necessary scale of the management response.

In the worked example (Fig 3) an assessment of herbivore grazing pressure on the heather moorland has identified under-grazing and the need to increase deer density. On the contrary, an assessment of herbivore grazing pressure within the native broadleaf woodland identified the woodland to be at risk due to over-grazing, resulting in the need for a reduction in deer density. This could lead to a potential clash in management requirements, and may not fit with the private objectives for a high enough deer density to support a stalking business.

5. Prioritised Management Plan

The previous steps prioritised areas of the site, according to agency frameworks and a comparison between local and private objectives, which required further assessment. This incorporated an appraisal of the severity of current and future deer impacts on achieving these objectives. The final step draws together the management objectives and any site assessments that have highlighted the need for changes to current management, and aims to agree a set of local land management objectives. If there are any remaining conflicts, the most effective way to incorporate the prioritised public objectives with private objectives for the site is through negotiation between the stakeholders, including neighbouring land managers where appropriate in order to achieve the management objectives. This will produce a site management plan that balances and prioritises public and private objectives.

In the worked example (Fig 3) the conflicting objectives that were highlighted in step 4 have been negotiated, and a management plan produced that prioritises the management actions necessary to enable woodland regeneration, whilst at the same time maintaining deer at a suitable density for estate business. The land manager has also agreed to monitor both the woodland and moorland habitat condition.

The most appropriate statutory body, or a DMG, would assist the land manager in identifying incentive schemes available to help achieve the required response, detailing what options are available and level of financial support. For example, deer fencing, deer culling and tree planting are some options for improving the sustainability of woodland. Information would be made available to the land manager as to which agency is appropriate for advice and financial support for each management response, and what agri-environment schemes are available. Once management measures are in place, further monitoring by the land manager and consultations with the appropriate statutory body would identify if the agreed objectives were being achieved. However, care needs to be taken by the authorities

implementing such schemes. Land managers entering a scheme need to be seen as not surrendering control, or merely exposed to restrictions and penalties.

This Risk Assessment attempts to provide a mechanism for assessing and combining both private and public objectives for the wider landscape, and is targeted at maintaining and enhancing the condition of the natural heritage from the wider landscape to the management level. It can be used to highlight conflicts between different natural heritage legislation for varied resources within the wider landscape, as well as with private objectives. However, this approach relies upon developing a working relationship between land managers and statutory agency staff, where the knowledge and needs of the land manager are respected and incorporated into management and monitoring decisions. As it relies on the voluntary co-operation of land managers, it is unlikely to result in an evaluation of pressures for all private land. It also starts from a natural heritage bias, whilst some land managers may be more likely to be driven by economics as well as by what payments are available for management of the natural heritage. Before they can be convinced to take part in natural heritage assessment, land managers need to overcome suspicion of officials, fear of restrictions and penalties as a result of monitoring and assessment, and concerns about inaccessible grant schemes. The working relationship and financial support for steps 1 and 5 are therefore extremely important aspects of the Risk Assessment for convincing land managers to help meet public as well as private objectives for natural heritage within the wider landscape.

5. Discussion

5.1 Deer in the wider landscape

Understanding and managing diffuse deer impacts within the wider countryside is a crucial part of meeting policy obligations in the designated and non-designated landscape. Herbivore grazing is one of the most influential aspects of wider countryside management, and can have a range of both positive and negative impacts on the natural heritage and on the socio-economy of the area. Deer can engineer the appearance of the landscape, open habitats and woodland, and although most parts of Scotland can maintain deer at a range of densities, there are a few sensitive areas where there is a challenging balancing act between deer densities and the condition of the natural heritage.

There are many potential conflicts both between and within UK and local policies, but currently there is no mechanism in place that is able to recognise these or attempt to resolve them. Additionally, although the impacts of grazers on habitats and species are often considered within natural heritage management, and methods for habitat assessment exist, there is currently no consideration of the direct or indirect impacts that grazers such as deer may have on meeting the objectives of the Water Framework Directive, proposed Soils Strategy and on some planning and development policies such as biofuel projects or carbon sequestration.

Historically the wider countryside has not received much attention compared to designated sites, as deer-related damage was most likely to be considered important when impacting a nationally or internationally important feature within a designated site. However, there is a statutory obligation under EC and UK legislation to recognise the importance of the non-designated wider countryside in managing habitats and species that cross management boundaries. These issues, as well as the need for sustainable deer management within a healthy socio-economic community, are beginning to be addressed by statutory bodies, for example within the DCS strategy consultation 2007-2008. Thus future policy application is likely to take a wider landscape view.

5.2 Translating policy to land management

A question of scale

With the above issues in mind, there needs to be consideration as to the scale at which different policies operate, and the variety of scales for the management of different habitats and species. Objectives expressed in many biodiversity strategies are often not spatially-explicit, which can make it unclear as to the extent to which they can be applied to a single land holding. Additionally, biodiversity targets for a species or habitat are often expressed as if they exist in isolation. This is misleading, and so the importance of factors such as species interaction and habitat mosaics need to be recognised when considering management actions. Increased clarity is therefore required to translate natural heritage policy, and biodiversity processes and targets, to land management.

Mechanisms to prioritise biodiversity actions

Although the Scottish Biodiversity Implementation Plan aims ultimately to be able to plan conservation at the wider landscape scale, it recognises that currently there are no

clear indicators, methods or mechanisms in place to achieve this. Indeed, no comprehensive maps exist of the location and extent of Broad and Priority habitats across the UK, and this is essential before the UKBAP and LBAP targets for maintaining and enhancing their condition can be met. The Scottish RBMP has addressed this issue for water bodies, and is in the process of categorising all of Scotland's water bodies and assessing those at risk of failing to meet their desired ecological status. The Implementation Plan acknowledges that more research is needed in many areas of countryside management before practical actions can be recommended and management advice given.

SNH are beginning to address the wide range of Action Plan biodiversity targets and recognises the need to streamline them, and prioritise information and actions. Such rationalisation of biodiversity targets, and of the advice available to the statutory agencies, will help to clarify the advice that is then passed on to land managers. A number of modelling projects have been carried out by SNH and Forest Research to investigate balancing habitat and species needs at different spatial scales^{42, 43}. These are still under development as they require further research to improve their practical applicability. The Deer Impacts PGIS model has been developed to predict where pressure from deer may be having the greatest impacts on vegetation and so prioritise areas needing assessment for deer management (see Section 4.1). Currently, trade-offs between managing the wider countryside for one species over another tend to be made by the land manager, and are often driven by factors other than ecology. Therefore, there is need for a prioritising system that is able to incorporate both public and private objectives.

Gaps in ecological knowledge for a number of species and habitats, as well as in appropriate methods to monitor and assess their condition, has left some aspects of landscape exposed with little or no legislation. This may be produced as knowledge develops, thus legislation is likely to evolve in the future with additional objectives set for existing or new Priority habitats. Together with current objectives to 'enhance' and extend Priority habitats, there is the potential that the future wider countryside will include a larger area of Priority habitats protected by legislation. Additionally, new governance procedures are likely to result in changes in politics, potentially leading to new objectives and natural heritage condition indicators being set. These changes may cause conflict with private needs. Therefore, it is important that the links formed to communicate objectives and management of all aspects of the landscape, are maintained in order that stakeholders are able to deal with future changes in policy, knowledge and objectives in a coherent, co-ordinated way.

Implementation powers

Natural heritage legislation obligations do not always appear to be backed up by effective national and local policy. There needs to be a stronger and clearer link between UK obligations at a national and international level and the actions and powers of statutory agencies at the local level. To help progress towards achieving biodiversity targets, statutory agencies rely on voluntary mechanisms such as deer management agreements with land managers. This requires co-operation between land managers and agency staff, and is often driven by financial incentives and encouragement of best practice through agri-environment schemes. Payments that directly influence deer management can occur through woodland regeneration schemes and the future RDC Tier 3. There are few mechanisms to impose compulsory action on a land manager where there is concern over damage to the natural heritage,

and those that exist are thought of as unusable, unclear and cumbersome. However, although the use of compulsion may be desirable in extreme cases, it is unlikely to encourage a good relationship between those involved and achieve longer-term collaboration to meet the diverse objectives. Improved definition and clarity of legitimate public natural heritage objectives is therefore essential to strengthen the case for production of private land management agreements.

5.3 Trust: private involvement in developing and delivering public objectives

If land managers are to become increasingly involved in helping statutory agencies meet legislative requirements, mutual trust is essential. Merely using tools of enforcement, such as those within The Deer Act, does not foster collaboration with land managers and can create conflict. There is a need to emphasise the importance of collaboration and reaching consensus, as well as personal and financial incentives, in addition to methods of enforcement and penalisation. Before this can be achieved, however, there needs to be an effective social structure in place. This will be essential if land managers are to take a more active role in the mapping, assessing and monitoring of the natural heritage.

In order to gain the agreement and co-operation of land managers it will be important to find ways that combine ecologists' evidence base with expert opinion and the experience and knowledge of the land managers themselves. This would improve the agency staff and land managers' understanding of what constitutes local desirable habitat condition, and help development of effective and appropriate assessment, monitoring methods and broad indicators of impacts on the local natural heritage.

The need for policies to progress beyond documentation and be translated to practical actions on the ground is currently being addressed by some statutory agencies. This would result in greater clarity of wider countryside objectives, enabling land managers and agency staff to identify where differing private and public policy objectives may need to be prioritised.

For all stakeholders to work together to agree management objectives there need to be effective links and fora for communication, as well as consideration of socio-economic issues. A way to achieve this may be through DMGs and established links with local agency staff, through which land managers could influence the direction and outcome of local legislation implementation. Achieving these things will valuably contribute to a working and effective code of practice.

5.4 The way forward.... balancing public and private objectives

Risk assessment approach

A process is needed that draws together the range of different landscape policies and objectives, which will then enable a selection criteria to prioritise conservation and monitoring needs, and agree the landscape management that is most appropriate for an area. A 'Risk Assessment' approach, as detailed in Section 4, should be developed in order to tackle management issues within the wider countryside and to achieve policy objectives where deer management can play an important part. Such an approach involving a two-way process of knowledge and input between land managers and

statutory agency staff can help prioritise and put in place working public and private objectives. This report provides an outline only for such an approach, as it would be more effectively developed and tested by the stakeholders who would need to use it. However, it will only be successful if there is an open and effective working relationship between agency staff and land managers. It also needs to be clear which agency should be approached to discuss site management, preferably being one 'port-of-call' for wider countryside policy, currently administered by Joint Agency working groups. Agency staff also need workable guidelines to help prioritise natural heritage objectives and targets at the local level, in order to balance public and private objectives on the ground.

Assessment and management tools

Models predicting habitat suitability and deer distribution (for example the Deer Impacts PGIS) may provide useful tools to help prioritise and target areas most in need of a landscape strategy to achieve policy objectives. These must be accessible to all of the stakeholders involved to be of workable use, and presented as practical maps with interpretable terminology. To aid decision-making, there should be easy access to information, for example through Local Record Centres and the Biodiversity Action Reporting System for sources of biodiversity data. Those habitats and species that have previously been poorly studied and understood need more developed guides for assessing what is considered as 'good condition' and 'risk'. A clear set of assessment methods and indicators for species and habitats need to be agreed in a partnership between land managers, statutory bodies and other appropriate stakeholders, with accessible advisory websites (such as the DCS Best Practice Guidelines) able to provide this information. Such assessments should also be developed for use at a wider landscape scale, with 'broad-scale' methods and indicators. Where there is good ecological knowledge, deer management may be a useful tool through which a desired habitat condition may be achieved.

Finally, there needs to be an effective communication process for interpreting this data and agreeing the resulting actions between stakeholders. As discussed previously, effective communication of information between all stakeholders, from listing relevant policy objectives, to resulting management requirements and the many schemes and incentives available to achieve this, will be essential for any management scheme to work.

Future pressures and challenges

Future policies and management of natural habitats will have to be considered in the light of potential environmental change. A changing climate may alter the ecology of the landscape as well as the relationship between the response of the natural heritage and impacts of habitat engineers such as deer. Any new environmental condition, where altered species and habitat requirements may now compete with each other, may lead to altered conservation requirements. Climate change predictions are still being developed, and there is insufficient information for clear projections to be made of how species and habitats may be impacted. However, the outcomes of such research should be incorporated into the management of biodiversity, as it may alter the way deer management impacts on the natural heritage. For example, management of deer that is currently acceptable may have to change in order to protect and increase the resilience of habitats also under threat of climate change or socio-economic change.

The Scottish Biodiversity Forum recognises that there is a need to identify measures and actions that will help mitigate against, and adapt to, climate change within an environmental context. To achieve this, future research through the Scottish Biodiversity Implementation Plan will need to increase our basic understanding of the links and consequences within ecosystems in response to environmental change, and be able to apply this knowledge at a variety of spatial scales. The challenge is to plan and manage upland landscapes on a large enough scale that will meet the policy requirements to maintain and enhance biodiversity value. To achieve this, there needs to be an effective overarching communication strategy in place that is accessible to and approved by all stakeholders, at a level that will encourage the involvement of land managers through voluntary actions as well as incentive schemes. To aid this, natural heritage policies need to be clearer and more effective at the local level. Only through trust between stakeholders, and with mutually agreed aims and actions, will there be a functioning link between the public and private objectives for the wider countryside. This will be particularly important in order to cope with future changes in needs, policies, aims, climate, and sources of income, such as tourism, and will enable easier development of effective landscape management.

Appendix I

List of acronyms

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CAP	Common Agricultural Policy	11
DCS	Deer Commission for Scotland	16
DILG	Deer Interagency Liaison Group	23
DMG	Deer Management Groups	22
EC	European Community	8
EPS	European Protected Species	8
EU	European Union	8
FCS	Forestry Commission Scotland	13
GIS	Geographical Information System	14
HAP	Habitat Action Plans	10
JNCC	Joint Nature Conservation Committee	16
LBAP	Local Biodiversity Action Plans	11
LCA	Landscape Character Assessments	14
LMC	Land Management Contracts	11
LMO	Land Managers' Options	11
NCO	Nature Conservation Orders	8
NE	Natural England	16
NGO	Non-governmental Organisation	7
NHF	Natural Heritage Futures	11
NPPG14	National Planning Policy Guideline on the Natural Heritage	13
NSA	Nationally Scenic Areas	13
PGIS	Participatory Geographical Information System	44
RBMP	River Basin Management Plan	13
RDC	Rural Development Contract	11
SAP	Species Action Plans	10
SBF	Scottish Biodiversity Forum	10
SGRPID	Scottish Government Rural Payments and Inspections Directorate	11
SEERAD	Scottish Executive Environment and Rural Affairs Department	12
SEPA	Scottish Environment Protection Agency	13
SFGS	Scottish Forestry Grant Scheme	13
SNH	Scottish Natural Heritage	11
UKBAP	UK Biodiversity Action Plan	10
WFD	EC Water Framework Directive	19

Appendix II

Information sources

1	Scottish Government Statistics	www.scotland.gov.uk/Topics/Statistics/Browse/Environment
2	EC Birds Directive (1980)	http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm
3	EC Natural Habitats Directive (1992)	http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm
4	The Conservation Regulations for Natural Habitats (1994)	www.opsi.gov.uk/si/si1994/Uksi_19942716_en_1.htm
5	Nature Conservation (Scotland) Act 2004	www.opsi.gov.uk/legislation/scotland/acts2004/20040006.htm
6	Scotland's Biodiversity: It's in Your Hands. A strategy for the conservation and enhancement of biodiversity in Scotland and Scottish Biodiversity Forum	www.scotland.gov.uk/library5/environment/sbiiyh-00.asp www.biodiversityscotland.gov.uk/ www.biodiversityscotland.gov.uk/pageType1.php?id=2&type=1&navID=27
7	Scotland's Biodiversity: It's in Your Hands. Strategy Implementation Plans (2005-2007)	www.cbd.int/default.shtml
8	Convention on Biological Diversity (1992)	www.cbd.int/default.shtml
9	UK Biodiversity Action Plan	www.ukbap.org.uk and http://www.ukbap-reporting.org.uk
10	Habitat and Species Action Plans	www.ukbap.org.uk and http://www.ukbap-reporting.org.uk
11	Species and Habitat Review Report (2007)	www.ukbap.org.uk/bapgroup.aspx?id=112
12	Local Biodiversity Action Plans	www.ukbap-reporting.org.uk
13	Natural Heritage Futures	www.snh.gov.uk/futures/Data/index.htm
14	Common Agricultural Policy	http://ec.europa.eu/agriculture/index_en.htm
15	Rural Development Contracts	www.scotland.gov.uk/Topics/Rural/SRDP
16	Rural Priorities	www.scotland.gov.uk/Topics/Rural/SRDP/RuralPriorities
17	The Scottish Forestry Strategy (2006)	www.forestry.gov.uk/forestry/infd-6aggzw
18	Town and Country Planning (Scotland) Act (1997)	www.opsi.gov.uk/acts/acts1997/ukpga_19970008_en_1
19	Planning Policy Guideline on the Natural Heritage (NPPG14) ('99)	www.scotland.gov.uk/Publications/1999/01/nppg14
20	Planning etc. (Scotland) Act (2006)	www.opsi.gov.uk/legislation/scotland/acts2006/20060017.htm
21	Nationally Scenic Areas	www.snh.gov.uk/scripts-snh/ab-pa03.asp
22	Landscape Character Assessments	www.snh.gov.uk/www/sharinggoodpractice/landscape.asp
23	European Landscape Convention (2000)	www.coe.int/t/dq4/cultureheritage/Conventions/Landscape/default_en.asp
24	Scottish Landscape Forum (2006)	www.snh.gov.uk/strategy/landscapes/default.asp
25	Common Standards Monitoring Guidance for Upland Habitats (JNCC)	www.jncc.gov.uk/page-2237
26	Water Framework Directive	http://ec.europa.eu/environment/water/water-framework/index_en.html
27	Water Environment and Water Services Act (2003)	www.opsi.gov.uk/legislation/scotland/acts2003/asp_20030003_en_1
28	Scotland River Basin District	www.sepa.org.uk/wfd/rbmp/scotland.htm
29	Scotland River Basin District, Characterisation and impacts analysis required by Article 5 of the Water Framework Directive	www.sepa.org.uk/pdf/publications/wfd/Article_5_Scotland_River_Basin.pdf
30	Drinking Water Protected Areas	www.sepa.org.uk/wfd/register/
31	Nitrates Directive (91/676/EEC)	www.sepa.org.uk/groundwater/legislation/nitrates.htm
32	Proposed Soil Framework Directive	http://ec.europa.eu/environment/soil/index.htm and www.scotland.gov.uk/Resource/Doc/184887/0052024.pdf
33	Scottish Soil Strategy consultation	www.scotland.gov.uk
34	Deer Scotland Act and damage by wild deer to woodland and the natural heritage	www.dcs.gov.uk/BestPractice
35	The Deer Act (1991)	www.opsi.gov.uk/acts/acts1991/Ukpga_19910054_en_1.htm
36	Deer (Scotland) Act (1996)	www.opsi.gov.uk/acts/acts1996/1996058.htm
37	Deer Commission for Scotland	www.dcs.gov.uk
38	Deer Interagency Liaison Group	www.dcs.gov.uk
39	The Wild Game Meat (Hygiene & Inspection) Regulations (1995)	www.opsi.gov.uk/si/si1995/uksi_19952148_en_1.htm
40	Highland Biodiversity Action Plans	www.highlandbiodiversity.com/html/counties/local_biodiversity_action_plans.php www.snh.gov.uk/data/boards_and_committees/main_board_papers/18%20Dec%2007/NH%20Trends%20and%20Indicators.pdf
41	Preparing For 2010: Natural Heritage Trends And Indicators	www.snh.gov.uk/pubs/
42	Balancing upland and woodland strategic priorities	www.snh.gov.uk/pubs/
43	Habitats and Rare Priority Protected Species	www.forestry.gov.uk/fr/INFD-758CCA

Appendix III

Examples of assessing deer impacts on key habitats in the Case Study

Habitat	UK Status	UKBAP Objectives	Examples of Favourable Condition Indicators	Monitoring Methods
Upland heathland	Priority	Maintain the current extent and distribution of the upland heathland that is currently in favourable condition. Achieve favourable condition on all upland heathland SSSIs/ASSIs by 2010. Achieve demonstrable improvements in the condition of at least 50% of semi- natural upland heath outside SSSI/ASSIs by 2010 (compared with their condition in 2000). Seek to increase dwarf shrubs to at least 25% cover where they have been reduced or eliminated due to inappropriate management. Initiate management to re-create 5,000 ha of upland heath by 2005 where heathland has been lost due to agricultural improvement or afforestation, with a particular emphasis on reducing fragmentation of existing heathland.	<p>(1) Dwarf shrub cover should be at least 75% over 75% of the dry heath community.</p> <p>(2) At least 2 species of dwarf shrub should be widespread and frequent in the sward.</p> <p>(3) Total cover of graminoids should not exceed 33%.</p> <p>(4) Bare peat should occupy <2% of the dry heath surface.</p> <p>(5) At least 25% of the management unit should be late mature/ degenerate age class.</p> <p>(6) Scrub/tree encroachment should be rare.</p> <p>(7) Signs of moderate or heavy grazing should occupy <5% of the heath area within a grazing compartment (SAC condition assessment)</p> <p>Vegetation structure - indicators of heavy browsing. (1) Less than 33% of last complete growing season's shoots of dwarf shrub species (excluding Myrica gale and Betula nana) should show signs of browsing. (2) In pioneer stage regrowth (or where there is B.nana or M.gale), less than 66% of last complete growing season's shoots of dwarf shrub species (collectively) should show signs of browsing.</p> <p>Physical structure - indicators of disturbance. <10% of the area should be disturbed bare ground. (CSM Guidance for Upland Habitats)</p> <p>Broad bands (>10m) of very obviously heavily browsed dwarf shrubs around grassland. (DCS)</p>	<p>(5) Heather age is reflected in the height and growth forms of heather.</p> <p>(6) Scrub encroachment can be checked using a combination of aerial photographs and condition assessment.</p> <p>(7) The frequency of droppings, extent of poaching, uprooting of dwarf shrubs, invasion by Juncus squarrosus etc. and presence of grazing induced growth forms of Calluna vulgaris indicate moderate and heavy grazing.</p> <p>Assessed against a visual estimate at 4m². Assessment best done in late winter/ spring</p>
Blanket bog	Priority	HAP target - maintain the current extent and distribution of blanket mire currently in favourable condition. Introduce management regimes to improve the condition of degraded but readily restored areas and maintain in, favourable condition a further 280,000 ha of degraded blanket mire by 2010. Introduce management regimes to improve the condition of a further 225,000 ha of degraded blanket mire by 2015, resulting in a total of 845,000 ha (i.e. around 75% of the total extent of restorable blanket mire) in, or approaching, favourable condition.	<p>(1) Bryophyte cover/ abundance - a constant sphagnum moss cover is indicative of active peat formation and is dependent on the maintenance of a high water table.</p> <p>(2) Dwarf-shrub cover >33%</p> <p>(3) Total cover of graminoids should not exceed 50%</p> <p>(4) At least 2 species of dwarf-shrub should be widespread and frequent.</p> <p>(5) Extent of exposed peat and erosion – disturbed bare peat should occupy <2% of the blanket bog surface.</p> <p>(6) Scrub/tree encroachment should be rare.</p> <p>(7) Signs of moderate or heavy grazing should occupy <5% of the blanket bog area within a grazing compartment. (SAC condition assessment)</p> <p>Less than 33% of last complete growing season's shoots of dwarf shrub species (excluding Myrica gale and Betula nana) should show signs of browsing.</p> <p>In pioneer stage regrowth, less than 66% of last complete growing season's shoots of dwarf shrub species (collectively) should show signs of browsing.</p> <p>Less than 10% of the area should be disturbed bare ground. Less than 10% of Sphagnum should be crushed, broken or pulled up. (CSM Guidance for Upland Habitats)</p>	<p>(6) Scrub encroachment can be checked using a combination of aerial photographs and condition assessment</p> <p>(7) The frequency of droppings, extent of poaching, grazing-induced growth forms and signs of browsing on Calluna vulgaris and other dwarf shrubs indicate moderate and heavy grazing.</p> <p>This can be assessed as a visual estimate in plots of 4m². Assessment is best done in late winter/ spring</p>

Table 1. Moorland habitats present at the site, together with UKBAP objectives

Habitat	UK Status	UKBAP Objectives	Examples of Favourable Condition Indicators	Monitoring Methods
Upland calcareous grassland	Priority	HAP target - maintain the current distribution and extent of upland calcareous grassland. Achieve favourable condition for at least 75% of upland calcareous grassland through sympathetic management by 2005 or as soon as biologically practical thereafter. Initiate pilot attempts to re-create at least 200 ha of upland calcareous grassland by 2005, with a particular emphasis on reducing fragmentation through linking small, vulnerable and discontinuous sites.	<p>Vegetation structure - indicators of current grazing (not CG14). (1) At least 25% of tips of live leaves and/or flowering shoots should be >5cm above ground and 25% <5cm above ground. (2) At least half of statements (a) to (f) should be true a) Less than 10% of grass and sedge tillers uprooted. b) Less than 10% of live leaves with signs of having been grazed for any of <i>Alchemilla alpina</i>, <i>Nardus stricta</i>, <i>Prunella vulgaris</i>, <i>Sibbaldia procumbens</i>, <i>Thymus polytrichus</i>. c) Less than 50% of live leaves of legumes or <i>Plantago lanceolata</i> with signs of having been grazed. d) Less than 66% of live leaves of grasses with signs of having been grazed. e) Less than 25% broken or uprooted (any of) <i>Huperzia selago</i>, <i>Minuartia sedoides</i>, <i>Saxifraga hypnoides</i>, <i>Selaginella selaginoides</i>, <i>Silene acaulis</i>. f) More than 50% of the shoots of <i>Dryas</i> at least 3 cm long.</p> <p>Vegetation structure - indicators of current grazing (CG14 only). At least 50% of live leaves and/or flowering shoots should be >20cm above the ground</p> <p>Vegetation structure - indicators of grazing (<i>Dryas</i>). At least 50% of <i>Dryas</i> leaves should be about 1.5cm long. Leaf length immaterial if there is more than 2 flowers per 100</p> <p>Physical structure - indicators of litter and ground disturbance. (1) The percentage ground cover for which dead plant litter forms a 'thatch' in patches more than 2cm across should be <10%. (2) <10% of ground cover should be disturbed bare ground. (CSM Guidance for Upland Habitats)</p>	<p>Note: Heavy grazing, especially during the summer, can cause soil erosion and may adversely affect species-richness and structural diversity, with a loss of tall herbs in particular. Very light or absent grazing with subsequent scrub encroachment, although more a problem of lowland calcareous grasslands, can also be a localised problem in the uplands and may be deleterious if it leads to a decline in species-richness. Habitat well represented in designated sites</p> <p>Assessed against a visual estimate at 1m² scale.</p> <p>Assessed against a visual estimate at 1m² scale.</p> <p>Assessed against a visual estimate at 1m² scale.</p> <p>Assessed against a visual estimate at 4m² scale</p>

Table 2. Grassland habitat present at the site, together with UKBAP objectives

Habitat	UK Status	UKBAP Objectives	Examples of Condition Indicators	Monitoring Methods
Upland oak woodland	Priority	HAP target - maintain the current extent and distribution of the upland oakwood system. Improve the condition of the existing upland oakwood resource. Avoiding other habitats of high nature conservation value, expand the area of upland oakwood by 7000 - 10000 ha (about 10%) by planting or natural regeneration on currently open ground, and by conversion from non-native plantations, by 2005. Complete the restoration to site-native species of 7000 - 10000 ha (10% of the total resource) of former upland oakwood that has been converted to non-native plantation on Ancient Woodland Sites.	(1) Tree regeneration - abundance of seedlings/saplings and browsing pressure (2) Tree regeneration – abundance of seedlings/saplings and browsing pressure (3) Preferentially browsed species - signs of browsing on palatable species (bramble, honeysuckle, greater wood-rush) (4) Height of browse-line (5) Epicormic shoots (6) Basal shoots (7) Ground flora (8) Bark stripping/ fraying (9) Ground disturbance (Forest Research / EN) Additional signs of adverse impacts by herbivores (DCS)	Ideally carried out in Feb / March. (1) Abundant unbrowsed seedlings and saplings indicate limited herbivore impacts (2) No saplings above ground layer of vegetation. No tree regeneration except in areas inaccessible to grazers – moderate/heavy impacts (3) Heavily browsed or species confined to areas inaccessible to grazers - moderate impacts. (4) Occasional signs of browsing - low impacts Window of depleted vegetation from ground level to 1.5-1.8m - moderate to heavy herbivore impacts. Branches in understorey well within reach of browsers - low impacts (5) Obvious difference above and below browse-line indicates moderate/heavy impacts (6) >75% grazed - moderate/heavy impacts (7) sward <5cm and dominated by grasses - moderate/heavy impacts (NB - unpalatable grasses <15cm) (8) >10% trees affected - moderate/heavy impacts (9) sheep tracks/ poaching over >20% plot - moderate/heavy impacts Age class of woodland skewed / becoming skewed towards older age classes, with no signs of regeneration for > 20 years. Low growing trees and shrubs pruned to a topiary effect. Shrub layer absent or along fence-lines. Bulky common mosses present at the expense of rarer species.
Native pine woodland	Priority	HAP target - maintain and improve the condition of the current area in the 'core areas' of the pinewoods listed in the CPI. By 2005, expand areas of the pinewoods by establishing 5600 hectares predominantly by natural regeneration - mainly in the 'regeneration zones'. By 2005, create the conditions for a further 5600 ha to be naturally regenerated over the next 20 years. By 2005, establish 25000 ha of new native pinewoods on suitable sites within the natural range of native pinewoods.	As above	As above

Table 3. Woodland habitats present at the site, together with UKBAP objectives

Water body type	Examples of reference conditions	Reporting category	Example Pressures and Condition Indicators
Standing water: low alkalinity, deep	Clear waters, naturally oligotrophic with low to neutral pH, low conductivity and alkalinity and very low levels of phosphorus and total nitrogen. A rocky substrate in the marginal zone results in abundant benthic diatoms. Fish species include brown trout and eel. Shorelines generally consist of coarse inorganic sediment, gravel or cobbles, with deepest areas covered by mud deposits. Where the shoreline is exposed, substrate of boulder or bedrock provides a poorer habitat for flora or fauna.	2a - Water body probably not at significant risk. Improve quality of information available for pressure and impact analysis. (SEPA)	Hydrology and morphology pressures – monitor fish Organic / nutrients – monitor macroinvertebrates, macrophytes

Table 4. Water body present at the site, together with SEPA characterisation and risk assessment

Supplement 2

Developing methodologies for assessing diffuse deer impacts in the wider countryside.

Authors

Stefano Fiorini	Macaulay Institute
Dr Justin Irvine	Macaulay Institute
Dr Imogen Pearce	University of Aberdeen

Testing local stakeholder response to the application of Participatory Geographic Information System to address Diffuse Deer Impacts.

Date: Wednesday 26th of March – 1900-2045 & Thursday 27th March 1900-2100.

Venue: Inchnadamph Lodge Lecture & Study Facilities.

Participants (in alphabetical order):

Sue Agnew (SNH)

David Allison (Westminster)

Sinclair Coghill (DCS)

Stefano Fiorini (The Macaulay Institute)

Justin Irvine (project leader - The Macaulay Institute)

Jim McLeod (The Macaulay Institute)

Steve Palmer (University of Aberdeen)

Michael Ross (Quinag/Ardvar)

Charlie Shaw (Ben more Assynt)

Alan Walker (Merkland Estate)

Mark White (Glen Cassley)

Apologies: Donald Clark (Duchally).

Main Objective:

To test the application of Participatory Geographic Information System (PGIS) for developing understanding and consensus between land managers and the public agencies over objectives for land and biodiversity management; specifically in relation to the management of red deer.

Background:

The European Union has committed the government agencies such as SNH and SEPA to achieving favourable status for 95% of the designated areas (SSSI's, NNRs, SACs etc) by 2010. Perhaps what is not so well known is that the European Union has also charged the UK with implementing management to achieve natural heritage objectives for the wider countryside (areas outwith designated areas). Essentially, this means managing the “priority habitats and species” (the habitats and species that are considered to require special conservation action under the UK Biodiversity Action Plan) whether they are inside or outwith designated areas. How this is to be achieved at the local level has not been

developed or communicated to private and NGO land managers. This is the subject of the Diffuse Deer Impacts project led by the Macaulay Institute and commissioned by RERAD. Work within this project has highlighted the large amount of natural heritage (conservation) legislation that has emerged in recent years. Our analysis indicates three major features that need to be addressed:

1. Define and communicate objectives: Investigate the lack of clarity in communicating these objectives to land owners and managers.
2. Understand the management implications of different policies: The existence of a number of conflicts between different pieces of legislation such that achieving the objectives of one policy may be counterproductive for other policies, or that achieving objectives for the same policy on adjacent areas might be problematic.
3. Account for the spatial dimension of management: Management agreements need to be at the landscape (e.g. areas including more than one estate or bordering estates) scale and objectives for one habitat need to be seen in relation to neighbouring habitats and land uses.

From the perspective of the land manager, this can lead to a lack of clarity from the public agencies over what is required leading to confusion over what is expected. Moreover, legislation does not account for the economic and socio-cultural costs associated with the management needed for achieving policy objectives.

Purpose of the Meeting

In order to start addressing the above issues we tested a new method aimed at developing understanding and consensus between land managers and the public agencies. This can be seen to form part of the suggested solution in Section 4.1 of Supplement 1 above. This is based on Participatory Geographical Information Systems (PGIS) which can aid communication between stakeholders over a resource that is disputed (Sandstrom et al., 2003) and generate more robust relationships between stakeholders (Kyem, 2002). In general, PGIS is a capacity-building and empowering tool because improving transparency and visibility between people and the state is central to its approach (McCall & Minary, 2005). It is used to legitimise local knowledge thus supporting local peoples' participation in decision making and mapping actions (McCall & Minary, 2005). One of the key elements is respect for and involvement of local knowledge early in a planning process. In this project PGIS is developed as a platform on which stakeholders' knowledge about objectives, barriers and management needs for land and deer management are integrated, assessed and addressed in a proactive way. We have developed a PGIS approach which aims to include knowledge from local land managers about the distribution of priority habitats in the selected areas. We also use the system to provide a readily accessible means for identifying the public objectives across a landscape rather than on an individual patch of habitat. This approach allows spatial data, which are often only available to agencies and formal institutions, to become available to local groups (McCall & Minary, 2005). Eventually, the knowledge about deer range and habitat use is combined with information on the distribution of "priority habitats" (and their favourable status), and the availability of management options that can contribute to achieve such status. This will hopefully allow three things to be identified:

1. Where, within an area, is deer management already enhancing natural heritage?

2. Where and when are deer populations likely to be having negative impacts on particular habitats?
3. The barriers and opportunities for achieving effective management in these areas (e.g. management that would be expensive in time and resources or where habitat objectives could be revised because they may be non achievable)

The workshop aimed to capture the response of deer managers and local agency staff to a PGIS approach and use this as a basis for reporting on the extent to which this approach could be useful in developing a shared consensus on the management's needs for deer and natural heritage in the wider countryside (Appendix 1). Specifically we are interested in evaluating whether this process is:

- a) Useful in clarifying the public objectives, and can highlight areas where land-use policies are in conflict with each other; and
- b) Useful in identifying and reaching consensus on which areas should be the focus of increased monitoring and special management (and resources needed to achieve management objectives), as well as agreeing that in other areas, less intense or no additional monitoring is required.

The premise of this work is that incorporating the opinions and knowledge of local land managers and stakeholders and allowing them to influence how policy is implemented on the ground will lead to more successful delivery of public and private objectives for the wider countryside facilitating the development of the system of reciprocity – reputation – trust necessary for implementing actions that might require short term costs to achieve long term benefits (Ostrom 1998).

Testing this approach also provides some information on the extent to which this is a useful method for landscape assessment in relation to public and private objectives (see parts 1 & 2 of Section 4.1 in Supplement 1)

Meeting Plan:

The meeting was structured over two evenings. This allowed for stakeholder annotations of the map (paper copy) of the test area on the first night to be digitised the following day and utilised in the live PGIS on the following evening.

Wednesday evening:

1. Introduction to the project.
2. Brief demonstration of the PGIS to familiarise the participants with the approach.
3. Evaluation and modification by participants of the priority habitat map derived by researchers from disparate sources (The development and critique of the PGIS is described the second progress report).

Thursday daytime:

Jim McLeod and Steve Palmer digitise participant modifications of habitat maps and develop versions of PGIS for Thursday evening

Thursday evening:

The live PGIS versions are presented to the participants and they are asked to evaluate how we have incorporated their knowledge and whether our PGIS system is useful in creating

agreement on which habitats in your area are either managed well, or are in need of additional monitoring or special management.

Meeting reports:

1st evening (Wednesday 26th March):

- a) Justin Irvine introduced the objectives and context for the workshop (powerpoint of this is attached in Appendix 2).
- b) Jim McLeod introduced the PGIS and described how it could be used to identify areas where deer might have a potential negative impact, referred to as “hotspots” for deer management (see Appendix 3). The PGIS essentially categorises habitats in relation to how tolerant they are to grazing impacts. It goes on to distribute deer across the landscape according to shelter, habitat preferences and features of the landscape. Finally, it identifies areas where the deer density may be higher than the tolerance value. Hotspots are picked out where this difference between tolerance and preference (density) is likely to be greatest. Hotspots are not necessarily where deer densities are greatest. They are areas where potentially the deer density is substantially greater than the underlying habitat can tolerate. (For example, an area of upland oak woodland may only be able to tolerate deer densities of less than 3 per km² so it could be a hotspot if deer densities were at 7 per km² – a relatively modest deer density.) This generated extensive discussion on how the approach is dependant on the quality and validity of the datasets that were included. Participants indicated a need for a commonly agreed set of baseline information as a starting point for management discussion. Others contested the quality of the PGIS deer density and distribution predictions for certain areas. The PGIS predicts deer distributions based on habitat, shelter and disturbance and for this it relies on both generalised ecological knowledge and locally-specific deer manager knowledge. If the predictions are contested this could undermine the application of this PGIS in supporting landscape scale management agreement. This supports the need to adopt a participatory approach so that both local and scientific knowledge are integrated into the PGIS and that its predictions of deer density and hotspots are reasonable and acceptable as starting points for negotiation to both local managers and agency staff alike. Whilst we had incorporated some local knowledge gathered from the same participants during PGIS interviews under another project we have yet to incorporate all of this information. Ideally this part of the PGIS needs more development to ensure that local knowledge is being utilised effectively.
- c) Next, an A0 sized paper copy map of the test area displaying the distribution of priority habitats was placed on the table and the participants were asked to annotate the map to correct or modify any features they felt were inaccurately portrayed. This included changing the habitat category of areas of the map, enlarging or reducing some areas of habitat and delineating where fences, paths, and hill roads were. The extent to which participants were able to do this was to some extent hampered because too much of the topographical detail was masked by the habitat map overlay. However, initial reluctance to annotate the map was overcome and quite a lot of modifications were made. In addition there were suggestions of additional data sources that could be included. For example, the SNH representative identified that locations of fences associated with recent Woodland Grant Schemes should be available and should be included in the PGIS, further stressing the importance of a system for collecting and integrating

environmental and policy information related to areas of Scotland in order to make better informed decisions.

Daytime (Thursday 27th March):

During the day researchers digitised the map modifications that stakeholders annotated on the habitat map the previous evening (Appendix 4). Two versions of the PGIS were developed for consideration by participants that evening. Both were based on the modified habitat map.

2nd evening (Thursday 27th March):

Participants were presented with updated versions of the PGIS, a description of its elements and the options for integrating the data in the PGIS in order to identify areas in which deer could have a negative impact on the habitat, as identified by the policy audit. The *two versions* are briefly described below:

Version 1. The habitat map was overlaid with the “grazing and trampling impacts” data (collected previously by the Macaulay Institute on behalf of the West Sutherland Deer Management Group). From this, priority habitat areas were identified that were categorised as having high impacts. Then deer count data were overlaid. This approach allowed visualisation across the test area of areas of priority habitat that were categorised as having heavy grazing impacts and whether this coincided with deer count distribution. It was recognised that deer count information is only a snapshot in time and may not represent the integrated effect of deer over time. However, it was interesting to note that to a large extent (but not completely), higher deer counts corresponded with higher impacts. Equivalent sheep data would be useful but does not exist at the same resolution.

The next step was to zoom in on one of these areas. We focussed on an area of woodland that was categorised as upland oak woodland. However, the local deer manager indicated that it was in fact an area of birch. This highlights the failings of the priority habitats map we developed. In this case the error came about because the woodland distribution is based on predicted woodland type rather than based on ground surveys. It is therefore important to incorporate local stakeholder knowledge to correct habitat maps which will help to develop a shared consensus with local agency staff and provide a solid basis for managing deer and the habitats they use.

The participants (local deer managers and the local agency staff) were then asked to assume that the selected area was indeed upland oak and to discuss management options for this habitat and the local deer population in order to protect and enhance its biodiversity value yet still provide shelter for the deer.

Version 2 was as described to the participants the previous evening: hotspots were identified using the modified habitat map and predictions of deer density distribution (based on habitat, shelter and the influence of local features such as paths, fences etc). Deer densities in the test area were distributed based on counts and the sex ratio for deer in West Sutherland.

After seeing both versions, the stakeholders preferred the assessment that was based on the impact layer (*Version 1*) but they *stressed the value of integrating local knowledge* in the PGIS and into the process of decision making. There was an acceptance that in the absence of impact data then *Version 2* which predicts deer density distribution could be a useful approach. Stakeholders also accepted the fact that it was not necessary for either version to be absolutely accurate in mapping habitats, impact or deer densities. Visualising these natural resources through a PGIS was sufficient to generate deliberation over management and

increased communication among estates and between agencies and estates. Interestingly, both the above approaches identified the same area of woodland as a potential area for negotiation over management actions.

Recording and characterising participant responses to the PGIS.

During and after the demonstrations, the participants were asked to respond to the following set of questions designed to characterise their response to a PGIS based approach for negotiating management of deer for natural heritage in the wider countryside:

- 1) Do you agree the areas identified by the model reflect “hotspots,” i.e. areas in which deer are more likely to have a negative impact on the priority habitat?
 - i) If not, could you tell us why?
 - ii) If yes, what are the implications of this for managing deer?
- 2) Does this approach help to clarify the public objectives?
- 3) How would you modify this approach to both better clarify public objectives for natural resource management and mediate private objectives?

Overall, the Thursday evening session resulted in a constructive discussion providing a structured response to the objectives set for the meeting. In the following paragraphs, Text in *italics* are statements that participants agreed to be a fair representation of the discussion and their opinions on the discussed question. During the workshop, when each of the above questions were debated, statements were written on flip charts and summarized and reviewed before the debate was taken to the following question.

Discussion of Question 1

Do you agree the areas identified by the model reflect “hotspots,” i.e. areas in which deer are more likely to have a negative impact on the priority habitat?

- i) If not, could you tell us why?
- ii) If yes, what are the implications of this for managing deer?

In general, the stakeholders found the PGIS *useful because it contained valuable information for management, despite the fact that monitoring is not new to deer managers. Baseline data on impacts* was considered particularly important especially now that discussions over deer management were more focused on their impacts rather than on their numbers. Stakeholders were *willing to be trained in habitat impact assessment* but they also expressed *concern with the requirements of time and resources for conducting effective monitoring*. This problem could be addressed by agencies working with land managers to *set up monitoring systems that are acceptable to the managers*.

Given that the approach had identified hotspots, the discussion moved on to the implication for achieving certain objectives in particular habitats, specifically woodlands. The movement and distribution of deer is affected by their preference for specific habitats, *i.e. deer tend to go into preferred habitats such as woodland*. Various options for managing this behaviour were discussed and assessed by the participants (note that a discussion of woodland might have been induced by the fact that a woodland area had been identified as a hotspot in the PGIS assessment). Fencing has been the preferred and most effective option for protecting specific areas in the past; *fencing was recognized to be the preferred way forward* by the managers and was not excluded as an option by the agencies representatives. Fences were associated with various issues, and problems. Participants commented that: *the cost of fences is not always properly covered by grants* resulting in fences of poor quality; there are *problems in maintaining a*

fence over its lifespan and the costs of fence removal. Fences are also particularly costly when built in special areas, e.g. along rivers. This requires schemes to be super-robust so that they can achieve the desired objectives. Excluding deer from certain areas is associated with the problem of these deer to move into other areas, and becoming an issue for someone else. For this reason care should be taken to remove the deer that are excluded by fencing.

During the discussions other management options were evaluated. *Intensive stalking in areas that need special attention has the downside of producing a “rollercoaster effect,” i.e. after deer have been removed and intensely stalked in an area they return to it after sometime, the practice is quite energy demanding on the side of the stalker and has welfare implication for the deer, finally, if the area of interest has not been protected by a fence it is vulnerable to the return of deer. Deer return in times that are not easily predictable, e.g. when weather conditions force the deer back on the vulnerable area or adopt diurnal movement patterns and are not there when stalkers can hunt them*

Concentrating sporting in the woodland was resisted because this kind of sporting is not sought by most clients, even if exceptions exist There was a discussion on the effect of increasing the area of woodland on deer populations. It was accepted that this would favour deer numbers increasing ultimately but stalking in this habitat is not what classic Scottish red deer hunting is about and therefore will not necessarily appeal to the conventional sport stalking market and does not fit with the local stalkers’ preferred practice.

The creation of alternative attractive areas was considered being an effective option; this could be achieved through feeding sites to concentrate disturbance and by habitat management and diversionary feeding such as new plantings of trees elsewhere or increasing improved grassland available to draw deer away. However, the model of deer distribution used in the PGIS needs to take into account the relatively higher impact on habitats surrounding a highly preferred grazing area rather than treating each habitat polygon independently.

The timeframe for reducing deer numbers was discussed. This needed to relate to the deer impact level and the fact that regeneration objectives might be better achieved with the rapid reduction of the deer pressure.

In summary, the PGIS and its visualisation of a hotspot in the landscape had generated a wide and constructive discussion between land managers and local agency representatives on the possible management problems and solutions.

Discussion of Question 2

Does this approach help clarify the public objectives?

PGIS was considered to be a useful management tool; however it did not address the issue of implementing the outcomes of the discussion. This referred to the fact that the PGIS took the discussion so far but did not produce solutions. This reflects the value of the tool as a focus for discussion and negotiation. In the future, it could be developed to explore management scenarios, record and assess their impacts. For example, for visualising and assessing the effect on deer distribution of a fencing option or for predicting and then assessing the outcomes of increased disturbance through recreational activities.

Although the PGIS included priority habitats it currently does *not include spatial information for priority species leaving open the question of how they fit in the picture.* For this workshop, these were left out because there is limited information on any of the priority species relevant to the

area. However, this approach could accommodate these objectives in a similar way to that used to assess diffuse impacts on the priority habitats.

Participants recognized the fact that *responsibilities of land managers are growing all the time*. However, this approach highlighted to participants that public objectives don't just apply to designated areas but also to the wider countryside. Once targets for the designated areas are met, the agencies will have an obligation to seek management agreements for priority habitats and species outwith these areas. This realization, however, was not received with resistance, instead it was accepted the fact that, in order to adapt to new challenges, traditional deer *management needed to change to avoiding becoming obsolete (fate of the dinosaurs)*.

Communication is important for moving the system forward and land owners need to be included if this approach is to have a stronger impact. At the same time government agencies (e.g. SNH) need resources to maintain active and effective channels of communication so that they are in regular dialogue about management and not just contacting land managers when problems arise.

Discussion of Question 3.

How would you modify this approach to both better clarify public objectives for natural resource management and mediate private objectives?

All the participants agreed that *deer are an asset for the environment and need to be managed sustainably*, and that it is *important to retain the economic value of this species*. The PGIS approach can be useful because it provides a central location of information. Stakeholders identified the need for *standardizing the process, practice and monitoring to achieve management objectives*, this could be done *through training for practitioners. This training should be added to the curriculum of courses and colleges that train deer managers*. Again, there is a *need to develop simple monitoring practices, for example, using photographs or simple grazing exclosures. Management objectives are better discussed and defined in small local fora*, rather than in big discussion groups or during official public consultations. *Deer Management Groups could be a useful forum for this, but they should include the people that can make decisions about deer management which may require both the owners and keepers to be present*. The decision making process *should also take into account issues of power relations within estates and between estates* which might affect the extent to which some participants are able to provide input or be fully represented during the process of decision making.

They also acknowledge that *the PGIS approach represented a good starting point for the agencies to start a dialogue with the land managers. Agency representatives pointed out the importance to start discussions of management before an issue emerges* and would like to have more time and resources to do this. Likewise, *managers also recognized that they and the estate owners should take the initiative in starting a dialogue*. Agencies are more likely to naturally take note and act on a direct communication from a land manager than they are to be proactive in communicating before a problem arises. This is largely because of time constraints and other pressures of work rather than a lack of willingness to engage.

A final and important point is that the PGIS needs to consider deer management in terms of how it sits with other private objectives, for example, the importance to some estates of the salmon fishery. In this case, fencing to protect riparian habitats from grazing may funnel deer to cross watercourses at points where salmon redds are focused. Thus achieving deer management for natural heritage not only needs to consider deer management for sport but also the competing objectives and enterprises present within a land-holding

Developing the PGIS as a negotiation and communication tool:

The general response at the workshop was that this approach was useful and could provide a new improved means to communicate and integrate public and private objectives for managing the wider countryside. In order for it to be developed to a stage where it could be applied in any given area there need to be further developments to a) simplify the way it functions b) increase the acceptability of its hotspot predictions and c) make it more interactive. The following list indicates some of the ways the PGIS could be developed:

Technical:

1. The way the PGIS predicts deer distribution can be refined to take into account the fact that preferences for one habitat are affected by the preference value of a neighbouring habitat.
2. Deer distributions need to be predicted for the area that a population of deer use rather than ignoring herd boundaries as is currently configured. This will require count data to be informed by stakeholder input to delineate the area for a particular population. This will allow the deer distribution prediction to only be derived by the factors operating within the range of the population and not influenced by features in an arbitrary boundary dictated by the buffer zone selected in a test area.
3. This PGIS could be extended to provide a management support system to explore alternative land use scenarios and “what if...?” questions.
4. The PGIS could be developed to allow more streamlined input or addition of data and modification/correction of existing spatial data sets.
5. The PGIS could be set up to allow web access (see below).

Socio-ecological

Our approach was biased by the fact that its starting point derived from the objectives set by current legislation. This is because it was linked to what emerged from the analysis of the legislation requirements and the action plans developed by government agencies at the National, UK and European levels (See policy audit output). A top down approach may result in a critical and defensive attitude in individuals that might already feel (or are) under pressure or threatened by increasing obligations for achieving public objectives. Dialogue and consensus would be facilitated by incorporating into the process the ability to map private objectives for culling, stalking and other land use objective. This would allow the private objectives to be balanced against those articulated by agencies and form the basis for a balanced negotiation and a means to build consensus for the management of hotspots within a heterogeneous management landscape.

Communications

There is a great deal of potential to develop a web-based approach to gather local knowledge. For example habitat maps could be available on-line or sent on CDs to land managers who could annotate them and return for digitalisation.

Furthermore, a web based map of habitats (or potential hot spots) could be developed which allows links to best practice guidance for monitoring and management. This needs to be accessible to land managers because it is these people who will be asked to deliver the public objectives.

Training

Making a clear link between the public objectives for a priority habitat or species and the best practice needed to achieve this is essential if the objective of protecting and enhancing the wider countryside is to be delivered. Central to the success of this is the ability of land managers to monitor the priority habitats and species. For this to be realised the methods need to be appropriate for the time and resources available to the managers. Agencies need to facilitate and invest in training land managers to ensure that the methods are consistent between areas. Indications from the workshop were that land managers already had a good knowledge of habitats and impacts and were prepared to undertake appropriate training to standardise the methods used across the deer range.

Conclusions:

1. The approach is innovative and effective: It increased communication because it brought together agencies and managers and generated useful debates over natural heritage objectives and deer management at a landscape scale (within and across estates) appropriate to deer. The presence of external facilitators (in this case the researchers) can be important for enhancing dialogue. Independent facilitators in charge of similar meetings may be key to their success.
2. It allows public objectives for the wider landscape to be visualised, helping to clarify what may be expected of the private land managers. Land managers were able to see the spatial distribution of habitats and how they are juxtaposed in the landscape. The approach allowed this information to be linked to documents outlining objectives and monitoring methods for these habitats thus promoting a more informed discussion on managing habitats in relation to the landscape scale mosaic of habitats, and other management objectives.
3. It identifies missing information/resources needed for management. Visualising the test area helps to clarify what other information is needed in order help generate an informed decision on management actions. For example, information on hind heft, fences around woodland, or frequently used footpaths (disturbance effects) can be added and incorporated into the maps. This information can be used by the PGIS to affect how the PGIS predicts deer distribution. This prediction is then more likely to be agreed by all interested parties because it will better represent what is happening on the ground rather than a hypothetical situation based on the management of a habitat without reference to its position and relations with other aspects and features in the landscape.
4. It allows for concrete, problem-oriented and constructive discussions. Visualising the test area and coming up with predicted hotspots means that discussion can focus on a) the reality that a particular hotspot is a problem, and b) what management can be agreed to protect and enhance the identified hotspot area.
5. It makes a constructive use of the information that agencies and DMGs have been collecting. At the same time it is democratic and inclusive. Although it is based on information held by public bodies, it is a means for local expert knowledge to be integrated and weighted in the same way as public objectives leading to greater agreement over the PGIS predictions for hotspots. By valuing local knowledge, collaboration between public and private objectives can replace conflict and misunderstanding. The PGIS could in the future be set up to include data derived from

managers' monitoring and record keeping, further extending the body of information used for discussing and deciding future management strategies.

6. It can be used in a DMG-like discussion setting, provided initial data collection from agencies and private interests is incorporated prior to the meeting. Care needs to be taken to ensure that the meetings are not too large or dominated by particularly powerful interests, and that owners are represented, or managers can fully represent estate owners, so that the agreed management actions can be concretely applied.
7. DCS or SNH area officers could be "data stewards" for various regions. In addition, developing a web-based approach allowing local land managers to interact and modify the spatial data relevant to their area would achieve a) the continuous integration of local knowledge about habitats and species and b) trust and ownership by land managers of data held and used by public agencies thereby increasing collaboration and consensus building.
8. It is adaptive in that it can incorporate any new spatially-explicit information and can be useful to explore scenarios and "What if...?" situations.
9. Macaulay can develop this PGIS to make it easier to use and provide technical support as well as facilitation skills in running meetings (subject to appropriate funding).
10. In relation to training in monitoring methods, whilst Best Practice Guidance on grazing impacts was familiar to the deer managers and they were familiar with the relevant priority habitats, there is still a need to develop, with the agencies and land managers, methods appropriate for the time and resources available to the land managers. These need to be simple and quick but also need to be able to meet the objectives of the monitoring, e.g. detect the type of the anticipated changes.

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- Sandström P, Granqvist Pahlén T, Edenius L, Tømmervik H, Hagner O, et al. (2003) Conflict Resolution by Participatory Management: Remote Sensing and GIS as Tools for Communicating Land-use Needs for Reindeer Herding in Northern Sweden. *Ambio* 32, 557–567

Appendix 1 – Letter of invitation to March 2008 PGIS workshop



19th Feb 2008

Dear,

Following our phone conversation we would like to invite you to join us at a meeting to discuss:

What are the public objectives for land management and how do these fit with deer management?

The meeting will be held over two evenings:

**7pm - 8pm on Wednesday 26th of March
and 7pm - 9pm on Thursday the 27th of March**

at the Inchnadamph Lodge Lecture & Study Facilities

Apart from yourself, we are inviting 5 other local land managers plus the local SNH and DCS representatives. During the meeting we will discuss the results of a recent Policy Audit conducted at The Macaulay Institute and the development of a Geographic Information System that can help facilitate collaboration over public and private objectives for land management. Your participation is important so we can incorporate your response to our approach and make recommendations to RERAD. I appreciate that this is a fair amount of time for you to commit - especially as it is over two evenings - but please read the following information which I hope demonstrates the relevance of this work to your needs and interests, and to deer management in Scotland in general.

Yours sincerely

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Context for the Meeting

The European Union has committed the government agencies such as SNH and SEPA to achieving favourable status for 95% of the designated areas (SSSI's, NNRs, SACs etc) by 2010. Perhaps what is not so well known is that the European Union has also charged the UK with implementing management to achieve natural heritage objectives for the wider countryside (areas outwith designated areas). Essentially, this means managing the “priority habitats and species” (the habitats and species that are considered to require special conservation action under the UK Biodiversity Action Plan) whether they are inside or outwith designated areas. How this is to be achieved at the local level has not been developed or communicated to private and NGO land managers. This is the subject of a project led by the Macaulay Institute, commissioned by RERAD. Work within this project has highlighted the large amount of natural heritage (conservation) legislation that has emerged in recent years. Our analysis indicates three major features that need to be addressed:

4. The lack of clarity in communicating these objectives to land owners and managers.
5. The existence of a number of conflicts between different pieces of legislation such that achieving the objectives of one policy may be counterproductive for other policies, or that achieving objectives for the same policy on adjacent areas might be problematic.
6. Management agreements need to be at the landscape (e.g. areas including more than one estate or bordering estates) scale and objectives for one habitat need to be seen in relation to neighbouring habitats and land uses.

From the perspective of the land manager, this can lead to a lack of clarity from the public agencies over what is required leading to confusion over what is expected.

Purpose of the Meeting

In order to start addressing these issues we are testing a new method aimed at developing understanding and consensus between land managers and the public agencies. We have developed a geographical information system (PGIS) approach which aims to include knowledge from local land managers about the distribution of these habitats in the selected areas. We also aim to provide a readily accessible means for identifying the public objectives across a landscape rather than on an individual patch of habitat. The idea is then to combine the knowledge about deer range and habitat use with information on the distribution of “priority habitats” (and their favourable status), and the required management needed to achieve such status. This will hopefully allow three things to be identified:

4. Where, within an area, is deer management already enhancing natural heritage?
5. Where are deer populations likely to be having negative impacts on particular habitats?
6. The barriers and opportunities for achieving effective management in these areas (e.g. management that would be expensive in time and resources or where habitat objectives could be revised)

We are seeking your input as a private land manager to evaluate whether this process is:

- a) useful in clarifying the public objectives, and can highlight areas where land-use policies are in conflict with each other; and

b) useful in identifying and reaching consensus on which areas should be the focus of increased monitoring and special management (and equally importantly), agreeing that in other areas, no additional monitoring is required.

Meeting Plan

On the *Wednesday evening* we need your help for about an hour to evaluate and modify our best estimate of where key priority habitats are in your area, and to discuss over a drink and snacks the stated public objectives for these areas.

On the *Thursday evening* we need your help to evaluate how we have incorporated your knowledge and whether our PGIS system is useful in creating agreement on which habitats in your area are either managed well, or are in need of additional monitoring or special management. Again, drinks and snacks will be provided to aid the discussions.

All travel expenses will be covered

Your attendance is very much appreciated and it is also an opportunity for your opinions and knowledge to inform and influence this research and ultimately influence how policy is implemented on the ground.

Meeting Timetable

Date/Time	Activity
Wednesday 26th March 1900-1910	Introduction
1910-1950	Stalkers/factors/owners modify our maps of where priority habitats are in the area.
1950-2000	Public objectives for habitat condition and management actions required are handed out for consideration before next evening
Thursday day time (researchers only)	Time for researchers to modify habitat maps using the information provided by land managers and run DeerMAP to produce a prediction of deer habitat use
Thursday 27th March 1900-1910	Reconvene and outline objectives
1910-2000	Researchers present PGIS with new land manager derived habitat map, DeerMAP derived deer habitat use and go on to identify hotspots for deer impacts
2000-2100	Land managers evaluate the extent to which the PGIS identifies areas where deer may conflicting with public objectives and discuss potential management solutions (how to achieve public objectives given the other habitats in the area?)
31 st March	A report of the meeting will be sent to all participants as a record of the proceedings.

**Appendix 2. (separate powerpoint presentation).
Introduction to the Diffuse Deer impacts Participatory PGIS workshop**

**Appendix 3 (separate powerpoint presentation).
Powerpoint version of the presented PGIS as presented on the first evening.**

**Appendix 4. (separate powerpoint presentation)
The habitat map before and after annotation by participants**